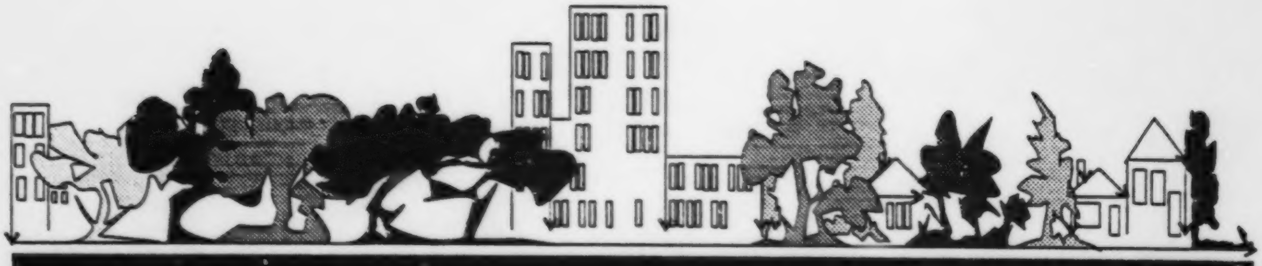
State of the Environment 1990



Regional Municipality of Hamilton-Wentworth
Planning and Development Department

October, 1990

ACKNOWLEDGEMENTS

Many people in various organizations donated their time and effort to provide the information on which this Report is based. The contributions ranged from the provision of documents, telephone conversations, and participation on a Technical Advisory Group, to the preparation of written material.

These people were; Frank Dobroff, Carole Donaldson, Peter Dunn, Hugh Eisler, Brian Gibson, Beth Goodger, Edward Harvey, Jim Halliday, John Irwin, Doug Keys, Scott Konkle, Kevin Laidley, Gerald Lake, Bill Lamont, Brian McHattie, Wayne McMillan, Bob Miller, Richard Murzin, Peter Rice, Keith Rodgers, Doug Sider, Jim Scharlock, Val Terluk, John Vogt, and Jack Wallage.

TABLE OF CONTENTS

1. INTRODUCTION 5
1.1 PURPOSE 6
1.2 METHOD: THE CONDITIONS AND TRENDS APPROACH . . 7

2. BIO-PHYSICAL COMPONENTS OF THE ECO-SYSTEM

2.1 AIR QUALITY 10

2.1.1 Air Pollution Index/Air Quality Index 12
2.1.2 Trends in Specific Pollutants 13
2.1.3 Overview and Continuing Issues 17
2.1.4 Local Initiatives 22

2.2 WATER QUALITY 28

2.2.1 Introduction: Governmental Jurisdictions 28
2.2.2 Pollution Trends 31
2.2.3 Continuing Issues 44
2.2.4 Vegetation/Fish/Wildlife in Hamilton Harbour 49
2.2.5 Liquid Waste and the Regional Sewer System 53

2.3 LAND 62

2.3.1 Jurisdiction 67
2.3.2 Aggregates 72
2.3.3 Agriculture 73
2.3.4 Habitat: Flora and Fauna 81
2.3.5 Waste 102
2.3.6 Contaminated Properties 111

2.4 HUMAN HEALTH RISK 125

3. CONCLUSION 128

LIST OF FIGURES AND TABLES

Description	Table #	Figure #	Chapter
AIR			
Air Pollution Index	1		2.1.1
Total Suspended Particulate		1	2.1.2.1
Sulphur Dioxide		2	2.1.2.2
Carbon Monoxide		3	2.1.2.3
Nitrogen Dioxide		4	2.1.2.4
Ozone		5	2.1.2.5
WATER			
Nitrogen and Phosphorus (Lake)		6	2.2.2.1
Spatial Dist. PCBs (Lake)		7	2.2.2.1
Vegetation and Fish (Harbour)		8	2.2.2.2
Phosphorus Loadings (Harbour)		9	2.2.2.2
Sources of Ammonia (Harbour)		10	2.2.2.2
Ammonia Loadings (Harbour)		11	2.2.2.2
Suspended Solids by Source		12	2.2.2.2
Suspended Solids Loadings		13	2.2.2.2
Cyanide		14	2.2.2.2
Iron		15	2.2.2.2
Zinc		16	2.2.2.2
Phenols		17	2.2.2.2
PAHs in Sediment		18	2.2.3.1
Zinc Concentrations		19	2.2.3.1
Toxicity		20	2.2.3.1
Hamilton Harbour Shoreline		21	2.2.4
LAND			
Land Area by Land Use	2		2.3
NEC Acres Designated	3		2.3.1.2
Mineral Map (O.P.)		22	2.3.2.3
ESA Map (O.P.)		23	2.3.2.3
Selected Agriculture Stats.	4		2.3.3
Land Division Records	5		2.3.3.1
Pesticide Use	6		2.3.3.2
Landfill Site		24	2.3.5.1

INTRODUCTION

1. INTRODUCTION

THINKING GLOBALLY

Vivid media images and the possibility that global environmental changes will affect them has convinced many people of the validity of "thinking globally and acting locally". The connections between the parts of the ecosystem (air, water, land, life) and human well-being has become apparent. This understanding, that everything is connected to everything else, has led to the conclusion that solving environmental problems requires more than good science and technology but also an emphasis on reexamining the social and economic rationale behind our decision-making.

Sustainable Development

The Report of the World Commission on Environment and Development, the Brundtland Commission, popularized the concept of sustainable development which is based on the idea that despite severe problems we must maintain economic growth in the developing world to meet the future needs of a rapidly growing population even while integrating environmental conservation and reducing the share of natural resources consumed in the industrialized nations.

The Canadian response to Brundtland's report has been extensive. In March 1989 the federal appointments to the National Round Table on the Environment and the Economy were announced. This group will advise the government on the integration of environmental concerns with social, and economic decision-making. The Provinces have also responded with similar multi-sector advisory groups.

INTRODUCTION

ACTING LOCALLY

Many initiatives have been undertaken locally to address environmental issues.

On December 5, 1989 , Hamilton-Wentworth Regional Council established a Chairman's Task Force " *to explore the concept of sustainable development as the basis for review of the Region's Economic Strategy and Official Plan and as an umbrella concept for tying in other potential policy initiatives of the Region."*

The Region has also set up a **Chairman's Advisory Council on Environmental Issues** to deal with environmental issues. The **Hamilton Harbour Remedial Action Plan** group was initiated by the federal interest in cross-boundary water issues and has been active in developing and promoting solutions to the environmental problems in the Harbour.

Citizens and industries have also undertaken many projects to help solve evident environmental problems. Major local industries have greatly reduced the contaminants in their waste water and air emissions. Citizen actions range from the clean up of garbage in Cootes Paradise to home composting and participation in community recycling efforts.

The variety of agencies and diversity of approaches suggested a need for a comprehensive overview that would document existing measures of environmental conditions, the results of recent progress in resolving environmental issues and provide input for the development of priorities for future action. At a fairly basic level there is a need to monitor and understand environmental changes.

INTRODUCTION

1.1 PURPOSE

"Before sustainable development can be applied in Canada, however, we must answer a fundamental question: what as a society are we going to sustain?"

(Greenprint for Canada Committee, 1989)

The State of the Environment Report has been prepared as a method of promoting a shared understanding of issues.

The purpose is threefold:

> To increase awareness about the state of the Region's environment, the effects of human activities on it, and the implications of changes in the environment.
>
> To provide a resource for continued public education and dialogue.
>
> To help identify areas in which we have inadequate or limited knowledge.

1.2 METHOD: THE CONDITIONS AND TRENDS APPROACH

The State of the Environment Report (SOER) undertakes to describe the status of the environment in the Region of Hamilton-Wentworth. Where data is comparable over time the Report will attempt to identify changes or trends. On the whole evidence for these changes is limited to the events of the last ten years. State of the Environment reporting in general tries to analyze trends and conditions in the biophysical environment but also tries to ascertain the pressures from human activities that change those biophysical elements.

The identification and discussion of social and economic trends in themselves, or the cultural values that form the basis of those trends, is not the aim of the SOER and must be accomplished elsewhere. Unlike the emphasis on social and economic issues which sustainable development implies this Report concentrates on the bio-physical features of the Regional environment.

The SOER is not a biological inventory but may suggest areas in which more particular scientific studies such as inventories may be warranted.

The SOER is based on a survey of existing information about the Regional environment and therefore contains no original research. In the attempt to condense, summarize or otherwise report what others have discovered about the environment in Hamilton-Wentworth subjective judgements about the importance or relevance of specific bits of information were inevitable. An effort has been made to be comprehensive but not exhaustive.

The Report stops short of making recommendations for new programs or policies. The task of setting targets or goals for improvements in our environment, as well as establishing the technological and social alternatives through which these goals can be acheived, must be accomplished through processes that are open and community-wide and that are able to deal explicitly with social and cultural issues; for example, the Sustainable Development Task Force. Nevertheless, as a Regional focus suggests, the Report tries to come to grips with those efforts at remediation or regulation already underway locally and the underlying jurisdictional questions.

This is the first attempt to produce a State of the Environment Report for the Region and it is worth noting that State of the Environment Reporting is still a developing field. At present there is no consensus on a common set of the most meaningful indicators or measurements of environmental health. In the long run, repeated measurements of the same variables will be the most useful for satisfactory identification of trends. Evaluating these indicators is beyond the scope of this Report.

INTRODUCTION

Structure

Broadly there are three ways in which to structure SOE Reports; 1) by issue, 2) by governmental jurisdiction or departmental responsibility and 3) by ecosystem structure. At the outset this Report was expected to conform to a framework based on ecosystem structure. Still, many environmental issues like pesticides in water courses, are not only air, land or water problems but include elements of each. As well, this Report follows political not watershed boundaries. Therefore, the Report does centre out issues for discussion when warranted and also describes much of the jurisdictional division of responsibility.

There is no doubt that waiting for the results of ongoing research or putting further effort and resources into more review of existing research will yield data that should or could be part of a complete SOER. However, in appreciation of the urgency many feel regarding environmental issues, there is little virtue to be gained by prolonging the production of such a report.

Process

The information and the views of agencies with primary responsibility for the various subjects developed in the Report were solicited. Initiatives undertaken by governments having jurisdiction have been included in the Report, but not all programs or regulations could be adequately described. Inevitably meaningful projects will have been inadvertently omitted and correspondence correcting shortfalls in information will be gladly accepted. Information sources are provided at the end of each section.

The Mandatory Health Services and Program Guidelines (1989) under the Statute of Ontario, 1983, C. 10, now require a periodic report from Boards of Health, (i.e. Regional Council), on local environmental risk areas. It is likely, then, that future SOE reporting will be undertaken at regular two year intervals although the scope of future Reports is not clear. In the interim shortcomings in this Report should be corrected by ongoing information gathering.

The activities of the many citizen's and voluntary groups involved in environmental causes are too diverse to be accurately portrayed without extensive effort. Due to the contributions of various individuals and the use of different information sources the reader will notice shifts in tone and style between different sections of the Report. Also, attempts have been made to reduce the use of professional or academic jargon but in some cases this has been impossible.

INTRODUCTION

INFORMATION SOURCES:

Brown, L.R. et al (World Watch Institute). State of the World 1988. New York: Norton, 1988.

Environment Canada. State of the Environment Newsletter. Hull: SOE Reporting Section.

Greenprint for Canada Committee. Greenprint for Canada: A Federal Agenda for the Environment. Ottawa: Greenprint for Canada Committee, 1989.

Keating, Michael. Toward a Common Future: A Report on Sustainable Development and its Implications for Canada. Environment Canada, 1989.

Livingston, John. "The Environment: What Have We Learned?", Canadian Geographic. Vol. 109 # 6, Dec. 1989/Jan. 1990.

Peterson, Lorne. An Ecological Portrait of the Ottawa-Rideau-Gatineau Region. Ottawa: January, 1990.

Planning and Development Department. Directions for the Nineties: Building a Healthy, Sustainable Region. Hamilton: The Regional Municipality of Hamilton-Wentworth, 1989.

Rees, William. The Ecological Meaning of Environment-Economy Integration. University of British Columbia School of Community and Regional Planning, 1989.

AIR

AIR

2.1 AIR QUALITY

2.1.1 Air Pollution Index/Air Quality Index

2.1.2 Trends in Specific Pollutants

- 2.1.2.1 Total Suspended Particulate
- 2.1.2.2 Sulphur Dioxide (SO_2)
- 2.1.2.3 Carbon Monoxide (CO)
- 2.1.2.4 Nitrogen Dioxide (NO_2)
- 2.1.2.5 Ozone (O_3)

2.1.3 Overview and Discussion of Continuing Issues

- 2.1.3.1 Vehicle Emissions/Dispersion Assessment
- 2.1.3.2 Quality of Life Study: Negative Image of Air Pollution
- 2.1.3.3 Bio-accumulation/Toxic Fallout
- 2.1.3.4 Epidemiology/Health Effects
- 2.1.3.5 Chloroflourocarbons and Ozone Layer Depletion
- 2.1.3.6 Dioxins and Furans/Program Initiatives

2.1.4 Local Initiatives

AIR

2.1 AIR QUALITY

Air is often taken for granted but as a natural resource its importance is pervasive. High levels of pollution over a sustained period of time can adversely affect human health, damage property and clothing, reduce visibility and be harmful to vegetation. During stagnant weather conditions people with chronic respiratory diseases can be especially affected. For instance, the Canadian and American Lung Association has recently studied acid aerosols (the gaseous precursors of acid rain) and determined that "acid haze" contributes to chronic bronchitis, an increased incidence of asthma and death due to respiratory failure. The economic costs for repair of materials exposed to a polluted atmosphere are also significant.

Weather conditions are an important factor in whether or not pollutants entering the atmosphere pose particular risks. Wind speed and wind direction affect the movement and dispersion of pollutants, while rainfall and humidity play a role in determining how pollutants affect buildings, vegetation and health. Also warmth and sunshine produce photochemical changes in pollutants.

In industrialized parts of the world human activity is the original cause of almost all of the pollution entering the air. Burning, vaporization and mechanical attrition are the common causes. Key sources are car and truck engines, furnaces, industrial processes and electrical power generation.

Until the 1960's only the visible element of air pollution was considered a problem worth regulating. Moreover, until recently air pollution was only considered to be noteworthy as a local problem in urban industrial areas. Now, with increasing knowledge of the long-distance transport of pollutants as well as evidence of long term accumulative effects air pollution has evolved into a problem of regional and national scope.

In Ontario the Environmental Protection Act gives the Ministry of the Environment general responsibility for air pollution concerns. Under Regulations 296 and 308 the Ministry enforces emissions standards against specific generators through Control Orders and Certificates of Approval. The Air Management Program is thus based on controlling man-made emissions to meet ambient air quality criteria. (AAQC) AAQ standards are based on estimated human health effects, odour or other nuisance effects, vegetation damage, corrosion etc..., whichever is most stringent. The MOE has therefore set-up monitoring stations to measure ambient air quality. The scientific evidence for trends in air quality is largely based on the data collected by these monitoring stations.

2.1.1 Air Pollution Index/Air Quality Index

The old Air Pollution Index (API) was based on 24 hour averages of two pollutants, sulphur dioxide and particulate matter. Sulphur dioxide and particulate matter had been chosen for measurement because research studies linked respiratory illness to high concentrations of those contaminants. The Air Quality Index (AQI) has recently been introduced which measures additional contaminants.

Similar procedures are now followed with the new AQI as were followed with the API. In the past, when the Air Pollution Index (API) reached 32 and was expected to remain at or above 32 for at least six hours, then an Air Pollution Advisory was issued. Owners of significant pollution sources were advised that they should prepare for a possible curtailment of operations. If the API reached 50, owners/operators of major pollution sources were ordered to curtail operations. An API of 50 was known as the First Alert Level. At an API of 75, the Second Alert Level was issued, and a further diminishment of polluting sources was ordered. The maximum threshold was an API of 100, where owners of all sources of pollution non-essential to public health and/or safety were ordered to stop all operations until the API declined.

Table 1

Hamilton's Air Pollution Index
1978 - 1987.

	Number of Incidents		
Year	>32	>50	Annual Maximum
1978	7	0	43
1979	23	1	55
1980	5	0	40
1981	8	0	38
1982	12	0	39
1983	1	0	37
1984	8	0	44
1985	2	0	36
1986	5	0	37
1987	2	0	38

The API for Hamilton has shown an improvement in the air quality in Hamilton with annual maximum API readings reaching generally lower levels than years previously. The positive implications of this general decline should be noted.

Nevertheless, the variability of the number of incidents over the 32 API threshold level is related to specific weather conditions. Inversion conditions (warm air over cold) trap pollutants near the ground. The number of inversions in a given year is uncontrollable and Hamilton will likely continue to experience Spring and Fall inversions which lead to pollution warnings based on the new Air Quality Index introduced in June 1988.

2.1.2 Trends in Specific Pollutants

Data for the evaluation of the relative air quality for Hamilton-Wentworth was obtained from Environment Ontario's Air Quality in Ontario, 1987 which provides data for a ten year time period from 1978 to 1987. Data is available for over twenty different pollutants. Of these pollutants, the following major components of air pollution are presented in this Report:

Total Suspended Particulate (TSP)
Sulphur Dioxide (SO_2),
Carbon Monoxide (CO),
Nitrogen Dioxide (NO_2) and,
Ozone (O_3).

Where Annual Mean data were available the above pollutants were compared with readings taken from monitoring stations located in Oshawa, Toronto and Windsor. Not all pollutants have been assigned hourly, 24 hour or annual criteria. Exceedances of hourly AAQ criteria are discussed but not presented in graphic form.

Caution should be exercised in drawing specific conclusions based on comparison of these readings. There is no standard with respect to the location of air quality monitoring stations between or within cities. The siting of monitoring stations is partly based on expectations regarding the location of major sources of pollutants. In Hamilton, monitoring stations are set-up mainly to help identify major point sources of air pollution. This explains why MOE monitoring stations are concentrated in Hamilton rather than in locations spread evenly throughout the Region.

Due to these differences in the location of the monitoring stations direct comparison of data should be avoided. The comparative trends are presented below in order to get a broad indication of whether the readings recorded by Hamilton-Wentworth's monitoring stations are following provincial trends.

2.1.2.1 Total Suspended Particulate

SOURCES: TSP is a generic term for airborne particles including dust, fly ash, smoke, pollen and the like. The sources are;

1. Industrial Processes which include combustion, incineration, construction, mining, metal smelting, processing and grinding.
2. Vehicles.
3. Natural sources which include windblown soil, forest fires, flowering plants, volcanic activity etc...

EFFECTS: Very small particles can penetrate deep into the lungs and contribute to respiratory disease. Serious health effects associated with suspended particulate matter may be caused by toxic particulate matter itself or dust which has adsorbed a gaseous pollutant on its surface. Corrosion, soiling, damage to vegetation and visibility reduction are additional effects.

TREND: Hamilton's levels of TSP dropped in the late 1970's. Industrial emissions have decreased more than the overall levels of TSP indicating that unquantified sources, such as wind-blown dust or dust generated by truck traffic, continue to have a significant effect on overall levels of TSP. 24 hour criteria (120 micrograms per cubic metre) were exceeded regularily at some stations. The Ambient Air Quality Criterion is 60 ug/m3 per year and has been exceeded consistently.

Despite improvements over the decade Hamilton has been consistently at or near the top of the levels reported by monitoring stations in Ontario cities. In part Hamilton's high levels are due to local problems, such as unpaved parking lots, surrounding particular monitoring stations. (See Figure 1)

2.1.2.2 Sulphur Dioxide (SO_2)

SOURCE: Up to 80% of the Sulphur Dioxide emitted in Ontario originates from non-ferrous smelters and electrical utilities. The remainder comes from industrial sources including iron ore smelters, vehicles and heating. In Hamilton most of the emissions come from industrial sources.

EFFECTS: At low levels (below 0.016 ppm) there are no known effects. Between 0.016 and .16 ppm there is some evidence that those who have asthma may be adversely affected. Between .16 and .34 ppm vegetation can be injured. Sulphur dioxide is a precursor of acid rain and other sulphate compounds which can have more pernicious effects.

TRENDS: Due to industrial initiatives in the early 1980's Hamilton has witnessed a general decline in the measured levels of SO_2. Since 1977 the readings have been well below the annual criterion of .02 ppm. This trend continued in 1988.

Amoung monitoring stations in the other Ontario cities shown in Figure 2, Hamilton had the second highest SO_2 levels in 1987. Generally, Hamilton stations recorded levels above those of the other areas during the last ten years even while all stations recorded significant decreases in the level of emissions. (See Figure 2)

2.1.2.3 Carbon Monoxide (CO)

SOURCE: About 80% of carbon monoxide emissions come from motor vehicles. The remainder comes from other fossil fuel combustion.

EFFECTS: At levels above the hourly average of 30 ppm smokers with heart disease experience cardiovascular symptoms. At levels above 50 ppm hourly non-smokers with heart disease experience symptoms.

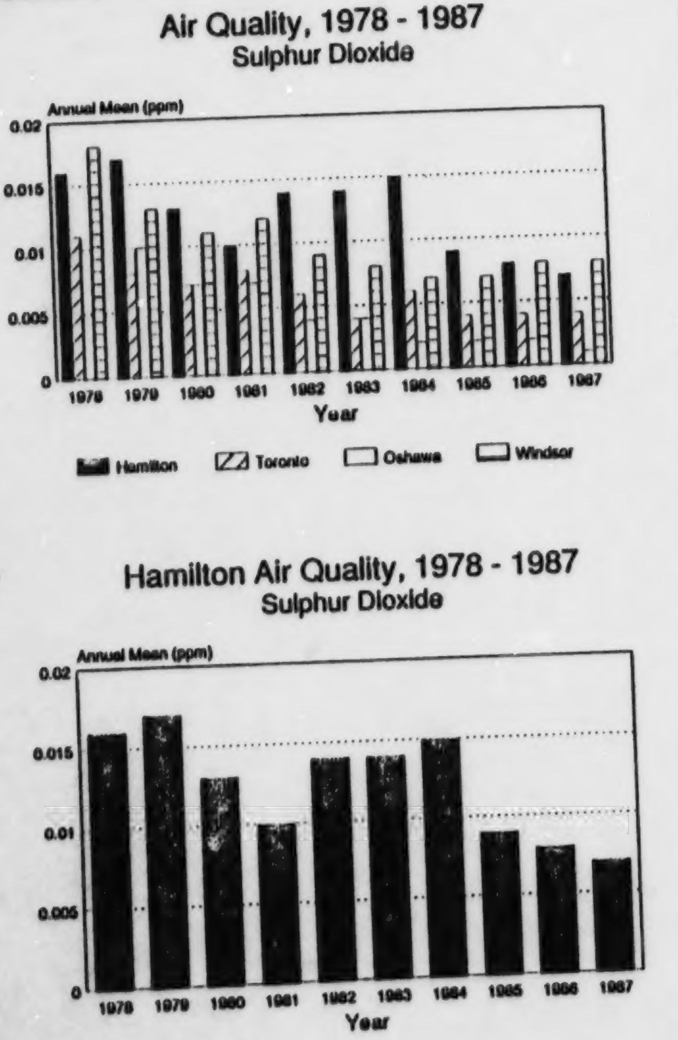
TRENDS: Due to tighter automobile emission standards there has been a general decline in ambient carbon monoxide levels. No Hamilton station reported exceedances of the one-hour criterion in 1987 or 1988. Declines in levels recorded in the early 1980's did not continue beyond 1984.

Carbon monoxide levels recorded in Hamilton have been similar to those recorded in Toronto throughout the last ten years. Generally, Hamilton's monitoring stations record levels on the high side of average but not out of line with other Ontario centres with high volumes of vehicle traffic. (See Figure 3)

2.1.2.4 Nitrogen Dioxide (NO_2)

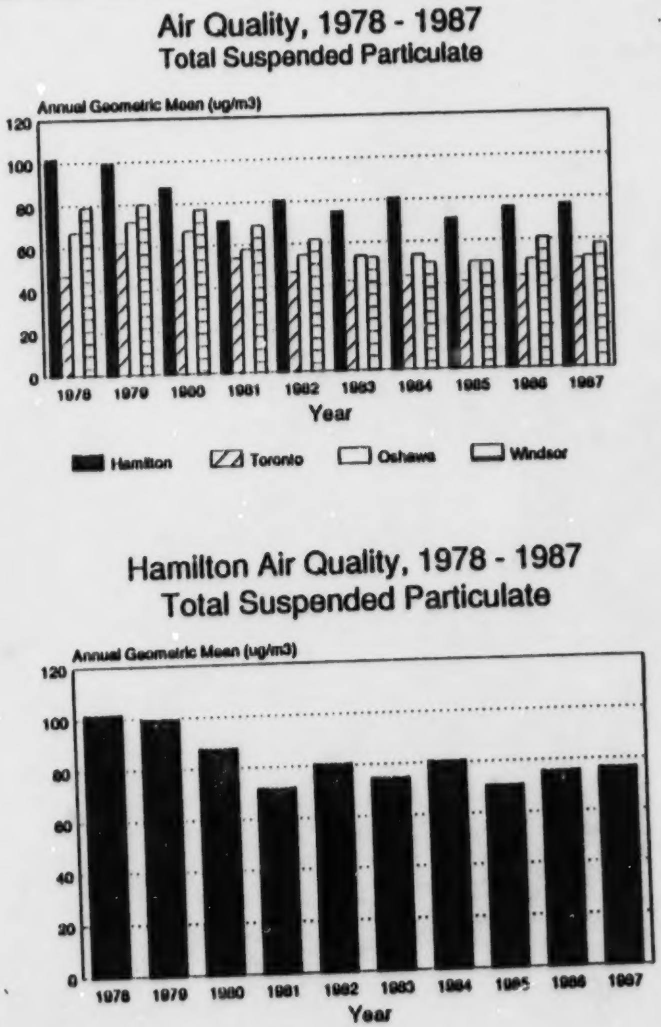
SOURCE: Nitrogen dioxides are products of high temperature combustion, including automobiles, power plants, incinerators. (Natural sources are from lightning and soil bacteria.) Transportation sources make up 60 percent of total NO_x emissions in Ontario. Nitric oxide is the precursor of NO_2. NO_2 reacts with hydrocarbons in sunlight to form ozone and with water to form nitric acid, a component of acid rain.

EFFECTS: At levels above .10 parts per million (hourly average) an irritating odour is present. At levels above .25 parts per million hourly there is an increase in bronchial reactivity in asthmatics.



Source: Ministry of Environment, 1989

Figure 2 : Annual Mean (PPM) Chart



Source: Ministry of Environment, 1989

Figure 1 : TSP Annual Geometric Mean (ug/m3)

TRENDS: The Ontario wide trend in NO_2 has been for levels to remain more or less constant. After significant decreases in 1978 and 1979 the Hamilton levels have been relatively steady, echoing the provincial trend.

The recorded level of NO_2 in Hamilton has remained roughly equivalent to those of levels recorded in other Ontario cities. (See Figure 4)

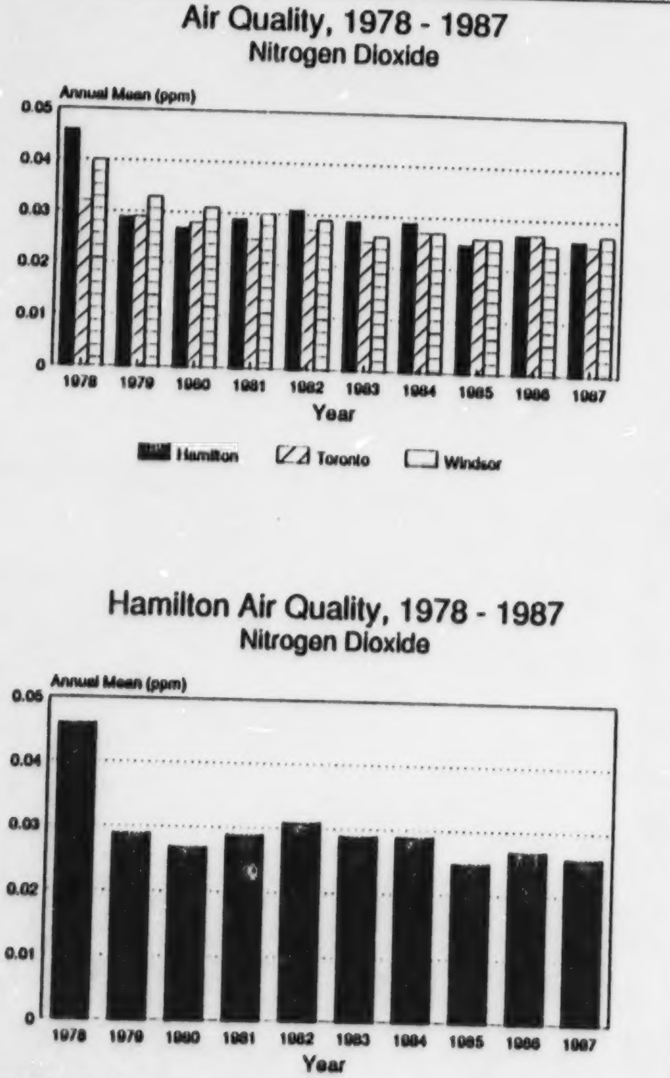
2.1.2.5 Ozone (O_3)

SOURCE: Ozone is produced by photochemical reactions in the atmosphere. It is formed downwind of nitrogen and hydrocarbon sources and capable of travelling long distances. Ozone concentrations follow annual and daily patterns, with the highest levels occuring on summer afternoons. Much of the ambient ozone in the Hamilton area is due to pollutants which enter the atmosphere in the U.S. (Cleveland, Ohio Valley etc...). Low level ozone is not to be confused with the naturally occuring high level ozone, i.e. the "ozone layer".

EFFECTS: At levels above 80 parts per billion (hourly average) ozone is injurious to many kinds of vegetation. This includes cash crops such as soy beans, potatoes, white beans, tomatoes and tobacco. It is very difficult to estimate the value of crop losses due to ozone but they are considered significant. At 120 parts per billion an athlete's performance decreases and at 200 parts per billion lung function in people exercising is decreased.

TRENDS: Hamilton's ozone levels have remained at about the same level throughout the decade with the exception of a few years in the mid 1980's when levels were somewhat higher. In 1987 all monitoring stations were still recording vegetation damaging levels over 80 ppb. Preliminary figures from 1988 suggest that readings will go higher than those recorded in the mid-eighties. Ozone therefore remains a concern but addressing emissions cannot be done solely at the provincial level because of the distant sources of pollutants. Effective action must take place at the national and international level.

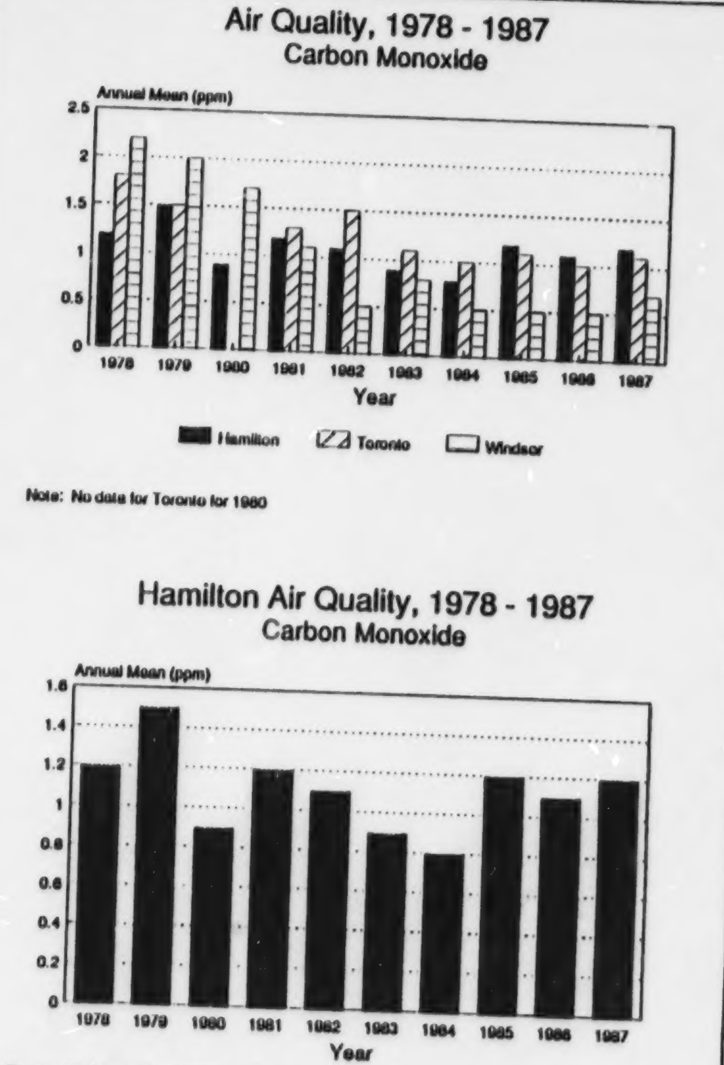
Hamilton's Ozone levels are generally no higher than those recorded elsewhere in the province. Surprisingly, rural areas often experience higher levels of ozone than urban areas because of, among other reasons, the distant sources of the original pollutants. Although Hamilton's levels are comparable to other urban areas they exceed Ambient Air Quality Criteria. (See Figure 5)


Air Quality, 1978 - 1987
Nitrogen Dioxide

Hamilton Air Quality, 1978 - 1987
Nitrogen Dioxide

Source: Ministry of Environment, 1989

Figure 4 : Annual Mean (PPM)


Air Quality, 1978 - 1987
Carbon Monoxide

Note: No data for Toronto for 1980

Hamilton Air Quality, 1978 - 1987
Carbon Monoxide

Source: Ministry of Environment, 1989

Figure 3 : Annual Mean (PMP)

2.1.3 Overview and Continuing Issues

With the exception of a few contaminants, the last ten to fifteen years witnessed continual, province wide improvements in air quality. Airborne particulates and odours (Total Reduced Sulphur, TRS) have been Hamilton's major air pollution problems in the last decade. By the late 1980's both particulates and odours have been significantly reduced from levels commonly occuring in the late 1970's. These reductions are largely due to initiatives undertaken by specific companies in the heavy industrial area of the city. Negotiations with industry for further necessary reductions are ongoing. With the exception of a few particular problems with localized fluoridization, Total Reduced Sulphur and naphthalene, significant future reductions in ambient levels cannot be expected from reductions in emissions from industry sources.

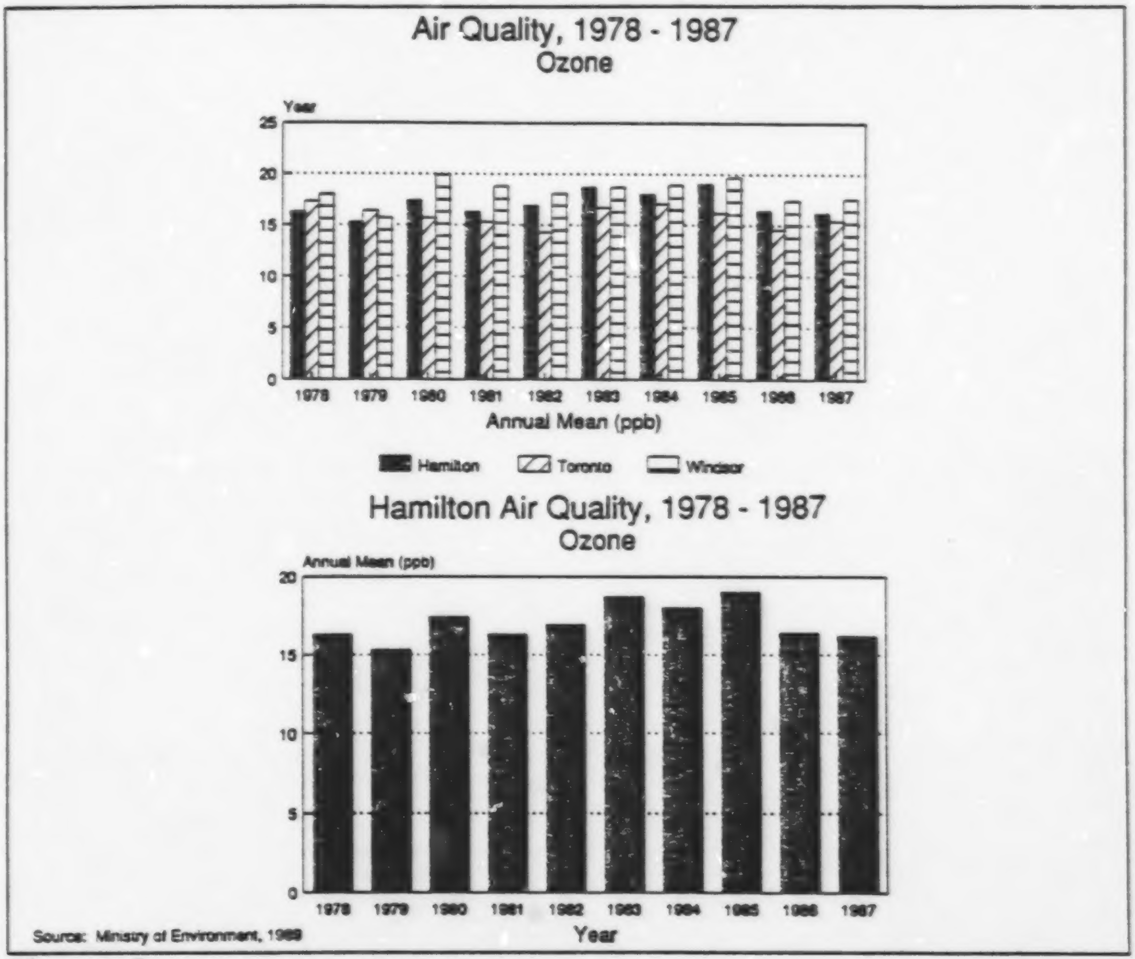
Ozone and TSP are pollutants of concern due to continued exceedance of provincial standards. Also sampling during inversions indicates that vehicle emissions have been the primary source of gaseous pollutants during API episodes above 32. Localized effects due to vehicle traffic have a significant impact on the monitoring stations and thus localized effects on humans and vegetation might also be expected. Given that industrial emissions will contribute a smaller share of overall pollution in the air increasing attention must be paid to transportation sources.

Vehicle Emissions/Dispersion Assessment

Localized effects of vehicle emissions anticipated from the new Red Hill Creek Expressway may be of concern. In particular, around the proposed King St. interchange the increased vehicular traffic is expected to adversely impact the local ambient air quality.

> "During instances of poor dispersion potential the air quality is predicted to be in exceedance of the Provincial criteria for both TSP and NO_2." (Rowan, Williams Davies and Irwin, 1989)

Aside from the new federal auto emissions standards which are to take effect in 1993 little amelioration of this problem can be forseen if no action is taken. The response to expectations of high pollution levels has been recommendations for continued monitoring.



Air Quality, 1978 - 1987
Ozone

Hamilton Air Quality, 1978 - 1987
Ozone

Source: Ministry of Environment, 1989

Figure 5 : Annual Mean (PPB)

AIR

Quality of Life Study: Negative Image of Air Pollution in Hamilton

Despite improvements in ambient air quality many people have a negative view of the relative quality of Hamilton's air. These negative perceptions have economic repercussions. Changing people's perceptions of Hamilton's air quality is given high priority in the recent Quality of Life Study. Reducing the Suspended Particulate matter in the air would be a primary method of doing this.

Aside from the health related goals which should speak for themselves, and although air pollution is a provincial responsibility, landscaping options (tree plantings) may be worth investigating since Total Suspended Particulate is an important element of the Coefficient of Haze, or COH. This measurement refers to the visible elements of air pollution. Trees are known to remove large amounts of matter from the air as air passes around the leaves. Functionally oriented programs to reduce TSP and thus reduce visible pollution can have an aesthetically positive outcome.

Bio-accumulation/Toxic Fallout

Air pollution is a contributing factor to ecosystemic toxicity. Ambient air quality standards are only based on immediate effects on human health and damage to vegetation. The question of "bio-accumulation" in the eco-system is not directly addressed. Pollutants that enter the air over periods of time may not exceed standards but persistent chemicals or heavy metals will fall to earth eventually. Once, in the water or soil these contaminants can be taken up by plants or microorganisms. Other animals which feed upon these plants or animals can then accumulate contaminants in their body tissue.

> "Evidence has mounted in the past decade that the atmosphere is a vehicle for toxic contamination to enter the Great Lakes...researchers now believe that at least half of all the toxic pollution entering the Lakes system comes from the air." (Great Lakes Reporter, 1989)

Epidemiology/Health Effects

The atmospheric transport of pollutants within and from outside our Region has been recognized as a problem requiring intensive and comprehensive efforts to limit diffuse or non-point sources of pollutants in order to remove persistent toxic chemicals from the ecosystem at large. The Great Lakes Water Quality Agreement 1987 and the Toxic Substances Control Agreement are both international agreements which include promises to take into account;

> "airborne pollutant's effects not only on human health, but also on aquatic life and the Lakes' ecosystem. Persistent toxic substances, even when discharged at levels believed safe for humans to breathe, can bio-accumulate in the food chain, reaching dangerous levels in animals at the top of the chain, like Great Lakes fish - and humans." (Great Lakes Program, 1989)

The most recent annual "Guide to Eating Ontario Sports Fish" presents evidence that levels of chemicals and heavy metals in fish at the top of the aquatic food-chain in Lake Ontario are lower than in the past few years.

Nevertheless, the concerns expressed regarding the overall toxic pollution in the ecosystem and human health merit attention.

> "When available data on fish, birds, reptiles and small mammals are considered along with human research, the Commission must conclude that there is a threat to the health of our children emanating from our exposure to persistent toxic substances, even at very low ambient levels.
>
> This threat is posed by continuing exposure to chemicals produced intentionally and unintentionally, including PCBs, dioxin, furan, hexachlorobenzene, DDT and its metabolites, dieldrin, lead and mercury. All of these chemicals are widely found in the Great Lakes Basin Ecosystem.
>
> The mounting evidence cannot be denied. Governments must emphasize development and implementation of a comprehensive, binational program to lessen the use of, and human exposure to, persistent toxic chemicals found in the Great Lakes environment. These chemicals appear to be causing serious and fundamental physiological and other impacts on animal populations in the Great Lakes Basin and undoubtedly elsewhere. The dangers posed to the ecosystem, including humans, by the continuing use and release of persistent toxic contaminants are severe."

(International Joint Commission. Fifth Biennial Report on Great Lakes Water Quality: Part II. Ottawa, 1990, pp.15-16.)

Though difficult to undertake, the ultimate solution to such problems is stopping pollution at its source rather than relying on the dilution effect of vast amounts of water or air.

AIR

Dioxin and Furans/Program Initiatives

The Ministry of The Environment in Ontario has responded to bio-accumulation and persistence concerns by releasing a discussion paper on reform to the Environmental Protection Act. If implementation of the direct emission limits which the document proposes ever occurs, enforcement will be a costly and complicated process since emissions will have to be monitored at the bottom of each smokestack. Evidently, this will require more equipment and inspectors.

Other initiatives include the recent ban on apartment incinerators to reduce emissions of dioxins and furans, particularily toxic compounds. The MOE is in the validity testing phase for implemention of a monitoring program for dioxin and furan contaminants.

Locally, a 13 million dollar retrofit of the pollution controls of the Solid Waste Reduction Unit, the Regional garbage incinerator, has been completed. A MOE soil study in the vicinity of the SWARU has, to some degree, allayed fears of accumulated contamination due to the operation of the incinerator. Ontario has not developed criteria for soil accumulation of PCDD/PCDF. Studies emerging from the European experience of incineration are mixed.

Chlorofluorocarbons and Ozone Layer Depletion

Measurements of the concentration of the ozone layer over our latitudes have revealed a six to eight percent reduction in the last few years alone. Predicted effects of ozone layer depletion include increasing skin cancers, temporary blindness, and unknown effects on the reproductive capabilities of plants and zooplankton. For example, the increase in ultraviolet light penetrating the water surface in Antarctica has led to expectations that all animals in the Antarctic food chain will suffer because the amount of microscopic animals (krill) multiplying in the sea has fallen.

The province has made moves to reduce the production of ozone layer depleting substances, Chlorofluorocarbons or CFCs. These new regulations will directly affect industries in Hamilton-Wentworth. The City of Toronto, took the regulation one step further and will require the proper storage, handling and recovery of existing CFCs.

DuPont Chemicals a primary producer of ozone depleting chemicals has for the first time taken responbility for the after-use effects of these chemicals and has begun the work of setting-up a CFC recovery operation. Test recovery facilities are operating in Great Britain and indicate that the technology is available if regulations promote their use.

AIR

Recently the province has announced new regulations to:

1) ban CFCs in industrial slurries where CFCs are made and in home repair kits for refrigerators and automobile air conditioners,

2) ban the few remaining aerosol propellants in medicines etc...

3) require the installation of "vampires" in all garages servicing air conditioners, (these machines ensure that the CFCs don't escape into the air during servicicng),

4) phase in the ban of most CFCs in foam cushions by 1993, and

5) propose future regulations to require the recycling of existing CFCs.

This issue exemplifies how solutions to negative global ecosystemic effects can be brought down to the local level for remedial action despite interjurisdictional complications. The Chairman's Advisory Council on Environmental Issues a Regional Committee advising the Engineering Services Committee is currently considering the wisdom of taking various actions to achieve the goals addressed by the City of Toronto.

2.1.4 Local Initiatives

The provincial Ministry of The Environment has general responsibility for air quality in the province. Given a goal of reducing sources of air pollution wherever feasible, the Region could play a role in encouraging positive changes in provincial policy. Apart from this intergovernmental role Regional policy with regard to air pollution is limited to appropriate management of its own activities in areas of jurisdiction incorporating a Regional mandate.

The Hamilton Street Railway has been participating in a demonstration program sponsored by the Ministry of Transport and the federal Ministry of Energy, Mines and Resources to use buses with natural gas burning engines as opposed to diesel. Natural gas buses are cleaner and quieter. Particulate and carbon monoxide emissions are extremely low. The fuel cost of natural gas is approximately 75% that of diesel. Six of these buses have been operating on Upper James in the last two years. By the end of 1990 15 more of these lower polluting vehicles will be added to the HSR fleet. Also the 1990 budget includes funding to study the extension of trolley service beyond the 50 bus/three route system now in place. Other alternative fuels will also be part of this study.

With respect to environmental issues, current Regional Official Plan policies are oriented towards environmentally sensitive areas. That is, to traditional natural resource protection through land use controls. Current official plan policies at both the Regional and Area municipality levels either largely ignore or inadequately address the issue of air pollution. Only the Hamilton Official Plan has any policies regarding air pollution, and these policies are primarily concerned with dust and suspended airborne particulate. The sources of airborne dust vary but the maintenance of cleaner streets and better landscaping of unpaved parking lots has been suggested by the Ministry of Environment as among the ways the municipality could help to reduce TSP levels.

Planning and Development Department studies recognized the link between land use, spatial structure, transportation requirements and environmental impacts in the mid 1970's but the environmental impacts studied were related to Environmentally Sensitive Areas, not to ambient air quality. Even so, as early as 1975 the environmental implications of localized vehicle emissions effects were recognized.

> "Means to reduce adverse environmental impacts of truck traffic resulting from an existing truck route system which utilizes arterial streets having a high percentage of abutting residential land uses need to be identified." (Planning and Development Department, 1975-1976)

AIR

On the whole, community design in order to reduce automobile use is not done here in the Region.

In light of the recommendations in the Quality of Life Study the value of an image-building program to deal with air pollution should not be under-estimated. Province-wide or Region-wide affects of air pollution are the cumulative result of the consequences of innumerable choices made every day by individuals, not just the consequences of ongoing industrial practices. Since everyone is responsible **education, communication and participation** will be key features in environmental strategies. The Sustainable Development Task Force recently approved by Council is one example of this type of activity.

As the most easily solved problems are dealt with, Provincial controls will necessarily play a progressively lesser role in achieving future reductions in air pollution. The possibilities inherent in widespread lifestyle change, as indicated by people's interest in becoming "Green Consumers", will be more apparent as the years go by. The Region can support this enthusiasm by ensuring that its activities and projects are undertaken in an environmentally responsible manner but cannot mandate attitudinal changes through policy.

The current Regional Official Plan incorporates a committment to public transit/pedestrian alternatives to the private automobile. How effective we have been in promoting this goal is an open question. As vehicle emissions become of greater concern these alternatives will gain increasing importance as an environmental issue.

Planning principles oriented to protecting the environment, such as the "Green Cities" ideas, are oriented towards reducing the unnecessary use of the automobile. Any initiative which reduces fuel-burning can address energy-efficiency and air pollution concerns similtaneously. Such perspectives on urban-form take two general approaches; 1) spatial design for the reduction of automobile use and 2) urban design for the maximization of solar gain. Neither of these approaches has been thoroughly implemented locally.

The linkages between air pollution and transportation policy are known. Individual projects are assessed for pollution impacts but a general strategy that integrates transportation planning with transit planning does not exist. For example, methods for increasing pedestrian access exist but are seldom fully implemented. For instance, objectives for increases in car pooling could be promoted by area municipalities through multi-passenger discounts at municipal parking lots, or car-pool parking facilities at major regional interchanges.

AIR

Civic response to air quality concerns may take unexplored forms. In an effort to contribute to the attempt to reduce the emissions of greenhouse gasses the City of Toronto recently accepted in principle a report from its Environmental Advisory Committee to investigate the implementation of policies which would make everything connected to the private automobile more expensive. That is, fuel, parking and licencing fees. This report also recommends building code changes to increase energy efficiency. The City of Toronto is considering a By-Law to prohibit the idling of engines for longer than three minutes.

Transit Trends

In the light of air pollution concerns transit statistics take on added meaning. The recent Transportation Tommorrow study indicates a historical pattern of increasing automobile ownership and a growth in trip-making of 3.9% per year in the Greater Toronto Area. The growth in trip-making was higher than population growth due to a number of factors including demographic changes in employment and suburban auto-oriented development. This is a land use and design issue.

There has been a slow but steady growth in transit ridership across the Golden Horseshoe area of about 2.1% a year. However, the 2.1 % rate of growth in transit ridership did not match the 3.9 % growth in people's overall trip-making, with the exception of metro Toronto the transit share of work trips in Hamilton-Wentworth is higher than in any other of the Regional municipalities. More recent statistics provided by the Hamilton Street Railway show a significant 5% decrease in ridership between 1986 and 1988 on the Regional transit system. There may be many reasons for this, such as a possible increase in the per capita ownership of cars or changes in the locations of workplaces. A specific study would be required to account for changes in commuting or travel patterns.

AIR

INFORMATION SOURCES

Elkin, T.J. State of the Environment Report: Regional Municipality of Waterloo. University of Waterloo, School of Urban and Regional Planning: Waterloo, 1987.

Environment Ontario. Discussion Paper: Air Pollution, General Regulation (308) Stopping Pollution at its Source; Clean Air Program. Queen's Printer for Ontario: Toronto, 1987.

Environment Ontario. FACTS: Air Pollution. Ministry of the Environment, 1989.

Environment Ontario, (Prepared by Frank Dobroff, West Central Region). 1987 Hamilton-Wentworth Air Quality. Queen's Printer for Ontario: Toronto, 1989.

Environment Ontario, 1988 Hamilton-Wentworth Air Quality.

Environment Ontario, Air Quality in Ontario, 1987. Queen's Printer for Ontario: Toronto, 1988.

Environment Ontario, Appendix, Air Quality in Ontario, 1987. Queen's Printer for Ontario: Toronto, 1988.

Environment Ontario, Ozone effects on Crops in Ontario and Related Monetary Value. ARB-13-84-Phyto, 1984.

Environmental Protection Office, Controlling CFC's in the City of Toronto: A Role for Local Government. Toronto Department of Public Health: 1989.

Gordon, David ed. Green Cities: Ecologically Sound Approaches to Urban Space. Montreal: Black Rose Books, 1990.

Great Lakes Program, "Evaluating the Risks to Human Health Associated With Exposure to Toxic Chemicals in the Great Lakes Basin Ecosystem". SUNY: Buffalo, V.3 #4, 1989.

Great Lakes Reporter, "Clearing the Air: Battle Against Airborne Toxics Heating Up". The Centre for the Great Lakes: Toronto, V. 6 #5, 1989.

Israelson, David. "New Rules to Curb Use of Chemicals Harming Ozone", Toronto Star. May, 1990.

Latter, Gillian. "Plan a Green Community for Healthy Living, says Isaacs". Dundas Star Journal. Wed. May 9, 1990.

AIR

McLaughlin, D. and Pearson, R. Concentrations of PCDD and PCDF in Soil from the Vicinity of the SWARU Incinerator, Hamilton. Environment Ontario, Queens Printer of Ontario: Toronto, 1985.

Muir, Tom and Sudar, Ann, Toxic Chemicals in the Great Lakes Ecosystem: Some Observations. Water Planning and Management Branch, Inland Waters: 1987.

Morrison, Suzanne. "Acid Haze Harmful to Lung Health: Report" Hamilton-Spectator. May 1990.

Peat Marwick Consulting Group, Regional Municipality of Hamilton-Wentworth Quality of Life Study. Regional Municipality of Hamilton-Wentworth: 1988.

Planning and Development Department, Transportation: A Substudy of the Regional Official Plan Reports # 1 and #4. The Regional Municipality of Hamilton-Wentworth: 1975.

Planning and Development Department, Local Planning Branch, Information Hamilton. The Regional Municipality of Hamilton-Wentworth: 1989.

Rowan, Williams, Davies & Irwin Inc. Pollution Dispersion Assessment for the Proposed Mountain Transportation Corridor. Regional Municipality of Hamilton-Wentworth, 1989.

Toronto Globe and Mail, "City Sets Goal to Reduce Carbon Emission Levels." January 30 1990.

Toronto Area Transportation Planning Data Collection Steering Committee, Transportation Tomorrow Survey: An overview of Travel Characteristics in the Greater Toronto Area. Toronto: 1988.

Untermann, Richard. Accommodating the Pedestrian: Adapting Towns and Neighbourhoods for Walking and Bicycling. Van Nostrand Reinhold Company: Toronto.

WATER

WATER

2.2 WATER QUALITY

2.2.1 Introduction: Government Jurisdictions

2.2.2 Pollution Trends

- 2.2.2.1 Pollution Trends in Lake Ontario
    - Toxic Materials in Lake Ontario

- 2.2.2.2 Pollution Trends in Hamilton Harbour
    - Phosphorus
    - Ammonia
    - Suspended Solids
    - Cyanide
    - Iron
    - Zinc
    - Phenols

- 2.2.2.3 Pollution Trends in Creeks and Streams

2.2.3 Continuing Issues

- 2.2.3.1 Sediments and Landfill in Hamilton Harbour
- 2.2.3.2 Swimming and Recreation
- 2.2.3.3 Drinking Water

2.2.4 Plants and Animals in Hamilton Harbour

2.2.5 Liquid Waste and the Regional Sewer System

2.2 WATER QUALITY

The quality of water in Hamilton Harbour and Lake Ontario is vital to the almost half a million people who obtain their water supply from intake pipes in the Lake. The Region's watercourses and water bodies are also home, or indispensable elements of seasonal migration patterns, for wildlife. All animals in the food chain rely on water for sustenance or habitat. The quality of water in the Region also affects the general quality of life of residents and visitors having important effects on boating, swimming and shoreline recreational activities.

2.2.1 Introduction: Governmental Jurisdictions

Research has been carried on in many areas of our aquatic environment to measure the impact of man's activities on the state of water quality. Nevertheless many gaps exist in our knowledge of the problems and the solutions. Environmental management of our water systems has historically been a type of enlightened crisis management. Studies are undertaken and remedial measures proposed in relation to environmental concerns only when a situation appears to be reaching a state of emergency or near-emergency.

Many government bodies have some sort of jurisdiction or role to play when it comes to water in the Region: the Federal Government, the Provincial Government, the Regional Municipality of Hamilton-Wentworth, the Local Municipal Governments, the Hamilton Harbour Commission and Hamilton-Wentworth Conservation Authorities. To complicate issues further, most of the Region's drinking water is drawn from Lake Ontario, which thereby involves the United States Government, the State of New York and the quasi-judicial International Joint Commission, a body comprised of both Canadian and American representatives who review and advise on whether Canada and the U.S.A. are meeting the obligations they signed on Great Lakes Water Quality.

WATER

In the Region of Hamilton-Wentworth, the most influential level of government with regard to control of water and water-related issues is undoubtedly the Ontario Government and its agent, the Ministry of the Environment.

> "By virtue of the Constitutional Acts of 1867 and 1982, the prime jurisdictional authority over water management is generally held by the provinces. Therefore, the province is the main "water manager" and can determine its apportionment or regulate its quality to meet the provincial economic and social objectives.
>
> Under the Ontario Water Resources Act (OWRA), the Ministry of Environment is provided with authority to regulate the discharge of sewage and the taking of water by licensing municipal and industrial sewage works, potable water treatment systems and by granting permits to take water. The OWRA also attempts to generally discourage the impairment of any lake, river or stream through discharges of polluting substances under recourse of injunction, fine and imprisonment.
>
> The Ontario Environmental Protection Act (also administered by MOE) provides for the regulation of the deposit, discharge, or emission of wastes and substances (solid, liquid, gaseous) from industrial processes and the licensing of waste disposal sites and systems.
>
> The Ontario Environmental Assessment Act is also applicable to municipal and provincial undertakings, and through regulation could be applied to new undertakings by industry." [p.50,51 Remedial Action Plan 1988]

The role of the Region of Hamilton-Wentworth and the local municipalities in the regulation of water quality takes two forms; 1) land-use controls and 2) the implementation of pollution abatement schemes in the municipal sanitary and storm sewer systems and the municipal sewage treatment plants built and operated by these local governments.

Other important sources of regulation with regard to water quality and water courses are:

1) The Federal Government, which regulates water quality through the Fisheries Act and the Canada Waters Act and has guidelines set down for industrial discharges into the Great Lakes;
2) the International Joint Commission, which also sets down guidelines for municipal and industrial discharges into the Lakes;
3) and the Conservation Authorities.

The standard powers of Conservation Authorities in Ontario include control over the flow of surface waters, the ability to alter water courses, and the regulation of water in rivers and lakes through the creation of dams and reservoirs. In 1958 the Spencer Creek Conservation Authority was empowered via the Conservation Authorities Act to control fill , construction and alterations to Cootes Paradise. This authority was then transferred to the Hamilton Region Conservation Authority, when the name change took place.

In Hamilton Harbour itself, the Hamilton Harbour Commissioners control land-uses adjacent to the water which are utilized for port-related activities and are also is responsible for administering all water lots, docks, shores and beaches of the Harbour proper.

On the recommendation of the States surrounding the Great Lakes and the Province of Ontario, the International Joint Commission made a comprehensive list of "areas of concern" around the Lakes. Hamilton Harbour was one of the many areas requiring remedial action. The job of preparing a plan for needed improvements and rehabilitation of the aquatic ecosystem fell to the Hamilton Harbour Remedial Action Plan (RAP).

The Hamilton Harbour RAP consists of a Technical Team working with a community advisory group called the Stakeholders. The Stakeholders group of the RAP is comprised of numerous elements of society including politicians from all municipalities around the Harbour as well as representatives from local community groups, environmental groups, agencies from all levels of government and local industry. Both the Technical Team and the Stakeholders report their conclusions to the federal and provincial governments through the Canada/Ontario Agreement Review Board, an advisory board of the International Joint Commission. In an attempt to find solutions to ongoing pollution problems this group has been using an "ecosystem approach" and is now in the process of finalizing an implementation plan for the improvement of the water quality in Burlington Bay/Hamilton Harbour.

WATER

As might be supposed from the number of government levels and agencies involved most water quality initiatives require co-operation between different agencies. Successful outcomes of coordinated efforts amongst diverse bureaucracies and political entities are far harder to achieve than efforts by one government or agency acting in isolation. Examples of this type of coordinated, or perhaps, fragmented approach are the effluent guidelines for discharges issued by the Federal Government, the Provincial Government and IJC; the regulation of land-uses in the greater harbour area by the Harbour Commission, the Conservation Authority and the two levels of local government; and the financing and implementation of improved sewage treatment programs at the municipal level with the help of the Federal and Provincial Governments. (See discussion below of the MISA program, a provincial/municipal initiative.)

2.2.2 Pollution Trends

In the Region of Hamilton-Wentworth the largest bodies of water are Lake Ontario and Hamilton Harbour. The examination of water quality in this report is focused primarily on these areas. This focus reflects the availability of existing knowledge on water issues in the Region and particularily the work of the Hamilton Harbour Remedial Action Plan group which has published excellent material on the state of our waters.

A number of streams run through the Region before reaching the shoreline of the Harbour, Lake or Cootes Paradise. These streams, especially where they enter the larger bodies of water, are important for fish spawning. Upstream the wooded banks provide habitat for wildlife. Occasionally the watercourses are free from excessive stormwater runoff and remain coldwater streams, providing habitat for trout. Groundwater sources of drinking water are the rule in rural areas of Flamborough, Glanbrook and Ancaster. However, it is Lake Ontario and Hamilton Harbour that provide virtually all the water for the population and industry in Hamilton-Wentworth. Conversely the Lake and Harbour also receive the better part of the Region's water-pollution discharges.

2.2.2.1 Pollution Trends in Lake Ontario

Lake Ontario is threatened by many types of man-made pollutants but is still able to provide a suitable environment for a broad range of wildlife and fish, and contains water of sufficient quality that both Hamilton and Burlington obtain their raw drinking water supplies from intake pipes in the lake. The lake has in the past been severely threatened by increasing levels of phosphorus, PCBs and DDTs, but the present condition of Lake Ontario appears to be unchanging as far as most types of pollution are concerned.

Plumes of water being discharged from the more heavily-polluted Hamilton Harbour contribute to the pollution level of the lake. While for the lake as a whole, the Hamilton Harbour discharge doesn't supply the majority of toxic chemicals, the local concentrations of contaminants in the west end of the lake are significantly affected by the Harbour discharge. The overall level of the lake's pollution is determined by the combined volumes of all sources. These sources include, among others, industrial and municipal dischargers along the lake, precipitation, and polluted water from Lake Erie and the Niagara River. The Niagara River is the most significant contributor to pollution levels in the lake.

The local conditions are important for drinking water, beaches and the wildlife that spend the majority of their time close to this end of the lake. Discharge from the Harbour is periodically observed at the water-intake pipes for both Hamilton's and Burlington's municipal municipal water systems. To date, testing of the drinking water when these incidents occur has not presented situations that have been observed to cause drinking water quality standards to be violated.

Lake Ontario, like Lake Erie and Lake Michigan, has been exposed to a variety of pollutants for quite some time as a result of the large human population and extensive industrial activities located in areas adjacent to the lake. All three of these lakes have been threatened by direct discharges or indirect discharges from rivers and streams for well over a century. Into the 1970s all cities discharged raw sewage at some time, some on a regular basis, others to bypass raw sewage because of equipment failures or overloadings. Treated or not, the waste effluent from all STPs did cause accelerated eutrophication. This resulted in a substantial degradation of the quality of the lakes. In the early 1970s Lake Erie began to resemble an oxygen-defficient soup of water and algae due to an overload of nutrients. At the same time several species of birds found in Lake Ontario began to die in alarming numbers because of their high absorption of DDT, PCBs and mirex. Such environmental crises alerted governments on both sides of the border to the size of the problem.

Since that time attempts by state, provincial and the two federal governments to limit the amount of discharges of certain types of compounds into the lakes has led to a stabilization of the situation. With regard to several types of pollutants Lake Ontario appears to be in as good or better a situation than it was 10 to 15 years ago. Despite the success of present controls, Lake Ontario faces the threat of increasing nutrient loads due to future population increases. To compensate for population increases, the level of sewage treatment will have to be increasingly stringent to maintain the present, improved conditions. Many scientists feel that the entire Great Lakes system is now being threatened by a toxic mixture of various chemical compound loadings from non-point sources such as pesticide runoffs from farmland adjacent to tributaries and fallout from precipitation.

WATER

There are two general categories of pollution we can organize the subsequent discussion around;

1) pollution caused by **excessive nutrients** such as phosphorus that can alter the numbers and types of living organisms in water environments and,

2) pollution caused by **toxic materials** such as PCBs, which can accumulate in the food chain causing disease, toxic effects, mutations or infertility at higher levels in the food chain.

Nutrients in Lake Ontario

The concern over the level of nutrients being discharged into the Great Lakes has been evident among governments on both sides of the border since the late 1960s and early 1970s, when it became painfully apparent that Lake Erie was undergoing a process called eutrophication. When a lake begins to absorb too many nutrients, (phosphorus and nitrogen), the algae which require these nutrients are able to multiply at an accellerated pace. The subsequent decomposition of this algae uses up a great deal of the oxygen in the lake's water, which in turn reduces the number of other aquatic life forms that can survive in the water body. Eventually, the lake may begin to recycle nutrients as fast as they are loaded. In essence, the lake refertilizes itself with nutrients discharged into the lake in the past and the condition becomes self-perpetuating.

Actions were taken in the early 1970s to limit the amounts of phosphorus discharged into the Great Lakes, and there appears to have been some success in diminishing the amount of nutrient emissions into the lakes and into rivers flowing into the lakes. STPs around the lakes have generally been upgraded to allow for the precipitation of phosphorus from sewage. As more phosphorus enters a STP more precipitating chemical needs to be added to maintain effluent levels, also more sludge is created. Since 1983 there has been a slow but steady decline in phosphorus loadings to Lake Ontario. Canada first introduced restrictions of phosphorus in both home and industrial detergents to 2.2 percent by weight. By 1990 all of the American states bordering the Great Lakes will have implemented regulations reducing the maximum allowable percentage of phosphorus by weight in home detergents to 0.5 percent.

Unregulated dishwasher detergents are growing in importance as a phosphorus source which will make it more costly to treat sewage. The total volume of phosphorus entering the lake needs to be fixed in order to ensure that nutrient levels do not go too high. As the population surrounding the lake increases the volume of phosphorus entering the STPs will increase and more costly or stringent treatment will be required at all the STPs to ensure that the total loading does not increase.

WATER

Lake Ontario's estimated phosphorus loading is still well above the target loading set by the International Joint Commission. An estimated 9,561 tonnes of phosphorus enters Lake Ontario per year, 2,500 tonnes over the target figure of 7,000 tonnes. Nonetheless, Lake Ontario is the only water body in the Great Lakes to show a statistically significant decreasing trend in spring total phosphorus in the past five years. While the loading targets have not been met the second graph in Figure 6 shows that the concentration objective for the lake has been acheived, at least temporarily.

The largest sources of phosphorus pollution of Lake Ontario are direct municipal discharges, phosphorus arriving from tributaries, and phosphorus arriving from Lake Erie and the Niagara River. Industrial polluters appear to play a relatively insignificant role in phosphorus loadings to Lake Ontario.

Nitrate-plus-nitrite [NO2 + NO3] concentrations in Lake Ontario, unlike phosphorus, have continued to grow since the late 1960s, almost doubling between 1967 and 1987. (See Figure 6) No apparent adverse conditions have been caused by this growth in the nitrate-plus-nitrate concentration in Lake Ontario. Levels have not exceeded the maximum allowable level for safe drinking water supplies.

Toxic Materials in Lake Ontario

Monitoring of toxic materials in the Great Lakes was not a priority until relatively recently. In the past government agencies were primarily concerned with obvious indicators of large-scale pollution such as phosphorus and suspended solids discharges from sewage treatment plants and industry. Awareness began to grow in the late 1970s and early 1980s that small quantities of highly toxic materials such as organochlorine pesticides and chlorobenzenes could eventually become concentrated in particular types of fish and wildlife or could become absorbed into sediments in certain areas. Although there has not been a great deal of research (at least on a comparative basis or as part of a time-trend analysis) on toxic pollution in Lake Ontario, the 1989 Report on Great Lakes Water Quality has stated that Lake Ontario has the highest mean concentrations for all chlorobenzenes, PCBs, lindane, endrin, and p,p'-DDE of all the Great Lakes.

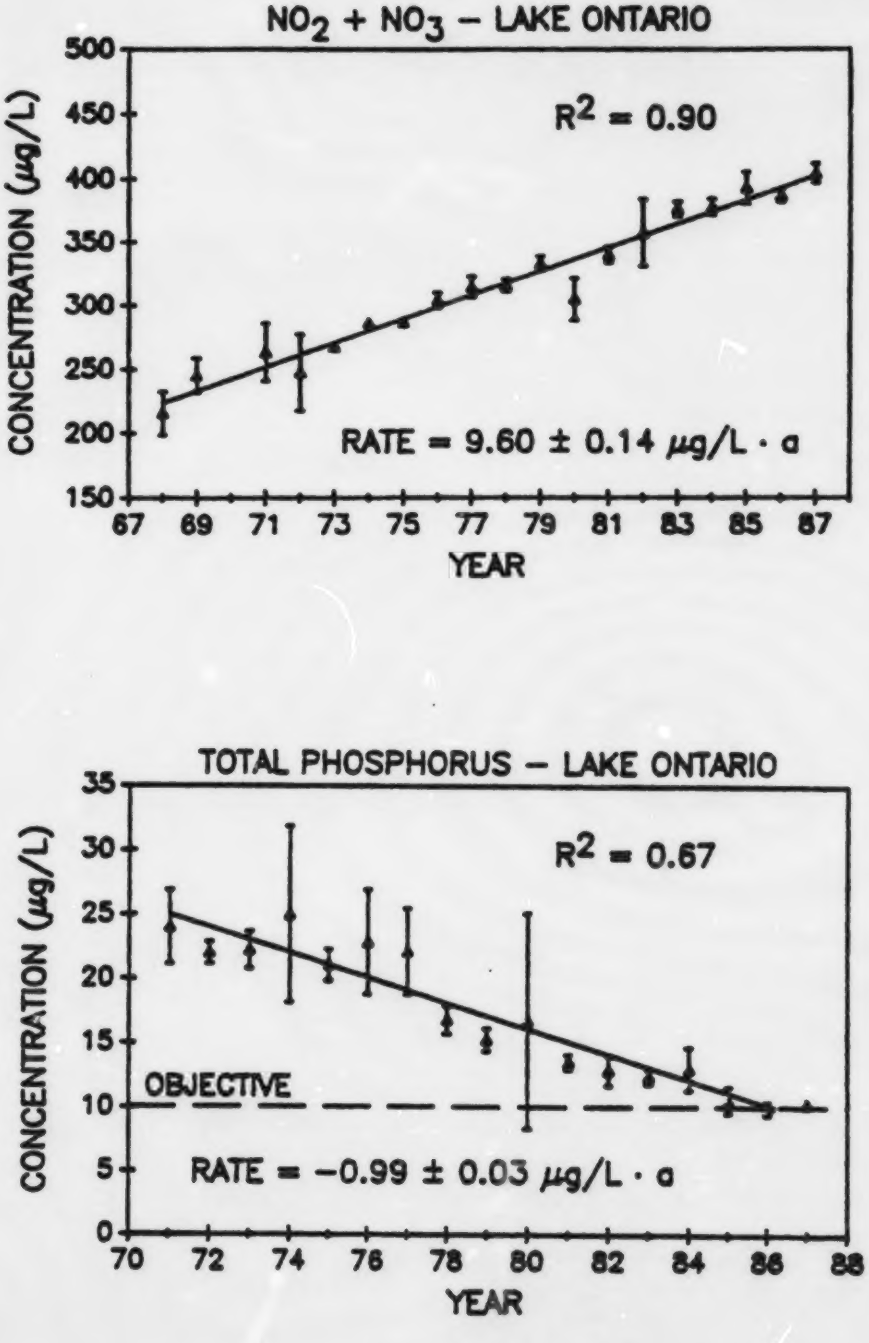


Figure 6

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

WATER

One method of estimating the level of toxic pollution in Lake Ontario has been to test fish and wildlife for evidence of highly toxic materials. According to the 1989 Report on Great Lakes Water Quality:

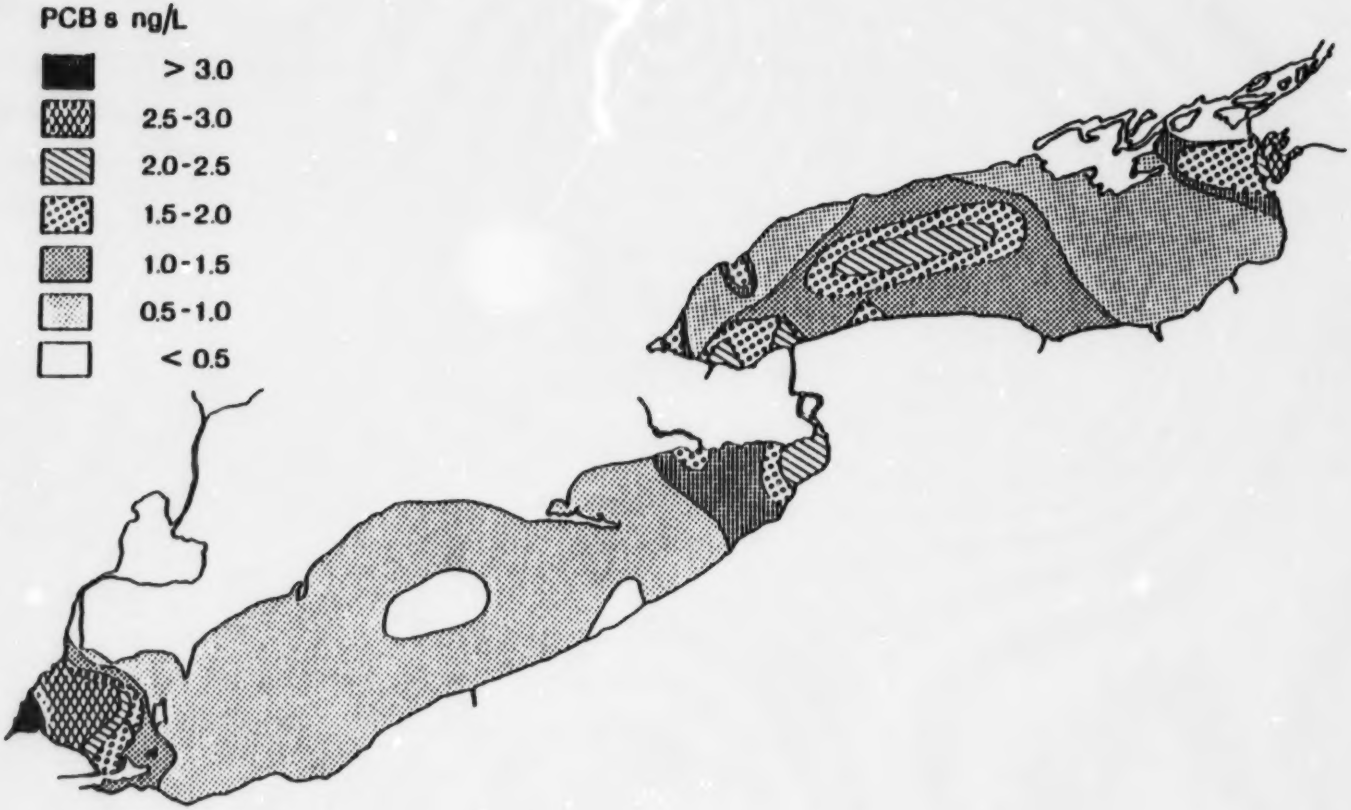
> "PCB concentrations in lake trout collected in 1987 were significantly ($p<0.05$) higher than those reported in 1985 and 1986. No significant changes in PCB concentrations in smelt were observed over the same period. Concentrations of mirex, DDT, dieldrin, and Hg in smelt and lake trout samples exhibited no significant trend during 1985-1987. However, mirex levels in lake trout over the same period exhibited significant ($p<0.05$) annual fluctuations. All other contaminants continued to decline steadily or have shown no significant change since 1977 for both Lake Ontario indicator fish species." [p.88 Great Lakes Water Quality Report].

Although the technology often exists to monitor these types of toxic compounds, testing on a systematic basis of different parts of the Lake and of discharges of individual STPs and industries is often just beginning or has not taken place. Yet it is becoming apparent that different parts of Lake Ontario are far more polluted than others with toxic materials like PCBs. (See Figure 7)

In its 1990 Biennial Report (Part II) the International Joint Commission has stated concerns about the general levels of toxic chemicals in the Lakes affecting human health.

2.2.2.2 Pollution Trends in Hamilton Harbor

Connected to Lake Ontario through a relatively small canal, Hamilton Harbour has its own ecosystem and is a separate entity as far as temperature, oxygen level and ability to absorb pollution are concerned. Water transfers between Lake Ontario and Hamilton Harbour bring cold water with large quantities of oxygen into the Harbour from the lake and move substantial amounts of polluted, warm water from the harbour into the western end of the lake. The levels of toxic pollution and nutrients in the waters relative to their size make the Harbour and Lake quite distinct.



SPATIAL DISTRIBUTION OF TOTAL PCB CONCENTRATIONS IN WATER IN LAKES ERIE AND ONTARIO

Figure 7

Source : 1989 Report on Great Lakes Water Quality

WATER

The Harbour has long been the repository for man-made pollutants, and has been substantially altered by land-fill operations and dredging. The Harbour accommodates waste discharged by the Region's sewage treatment plants and the area's two largest steel producers, Stelco and Dofasco. The Harbour bottom contains large quantities of pollution in its sediment from decades of heavy industrial discharges. Over the past one and a half centuries Hamilton Harbour has been transformed from one of the Great Lakes' richest areas in terms of wildlife, fish and vegetation to one of the most degraded areas in the Great Lakes. Although much progress has been made in limiting the amount of pollution discharged directly into the Harbour from industrial and municipal sources, Hamilton Harbour remains in worse condition than Lake Ontario.

Hamilton Harbour's environment has undergone a great deal of change over the past hundred and fifty years. In the early 1800s the Harbour was known as an abundant source of wildlife and fish, and the types of vegetation and size of fish catches found in the area were much commented on in historical documents as being unique for this part of North America. Unfortunately, one of the effects of industrialization was the destruction of much of the wildlife through encroachment on marshlands, through infill for expanding port facilities and steel mills, and through extremely-high levels of direct discharge of industrial pollution.

By the early 1970s industrial and municipal discharges to Hamilton Harbour were such that summer oxygen deficits were occuring in bottom waters. The species composition and breeding populations of wildlife and vegetation normally associated with Hamilton Harbour changed radically in the south-east end of the bay, and the cold-water predator species of fish that had traditionally resided in the Harbour gave way to warm-water foraging species of fish.

In the late 1970s and 1980s a concerted attempt was made by both Stelco and Dofasco to stop discharging large amounts of chemical byproducts of the steel-manufacturing process into Hamilton Harbour. The result has been a steady and impressive reduction in industrial discharges of many types of pollutants into the Harbour. Nevertheless, the Harbour's shoreline and sediments still contain the results of decades of poorly regulated discharge of chemicals and metals by industrial activities. Although direct pollution into the Harbour is now declining concentrations of many types of pollutants remain high.

Since 1987, the nutrients contained in the effluent of the Woodward Avenue Pollution Control Plant have decreased significantly. Accordingly, Windermere Basin has been subjected to a much lower level of algae producing phosphorus and oxygen depleting ammonia from the plant.

WATER

Recent improvements and those planned promise to reduce further the quantities of pollutants such as phosphorus being dumped into Hamilton Harbour. During the short and long-term a variety of initiatives are required to improve the viability of fish and wildlife in the Harbour and decrease the threat of pollution to drinking water and aquatic recreation. They include:

1) tracking down industrial polluters who discharge toxic materials into the municipal sanitary sewage system and the long-term application of better control technology by industry,

2) reductions in the amounts of phosphorus and other substances flushed down the drain by the average household in Hamilton-Wentworth through education re. substitutes and further improvements in municipal waste water treatment,

3) substantial reductions in the overflows of stormwater and sewage sewage that result in untreated sewage entering the Harbour

4) assessment and inactivation of the contaminants in the bottom muds of the Harbour,

5) restrictions on the amount, quality and design of infilling of the Harbour during its development and,

6) in Cootes Paradise, the construction of artificial barriers for marsh development,

If initiatives such as these are to succeed tenacious political will is required. Subsequently, the remaining problems facing the Harbour will be pollution from non-point sources such as deposition from the air, adjacent contaminated land-infill or polluted run-off, and barriers to public access.

Phosphorus

Industrial discharges of phosphorus into the Harbour have been systematically reduced from 1,200 kg/day in 1967 to less than 30 kg/day in 1987. Both Dofasco and Stelco complied with Provincial guidelines for phosphorus emissions in 1987.

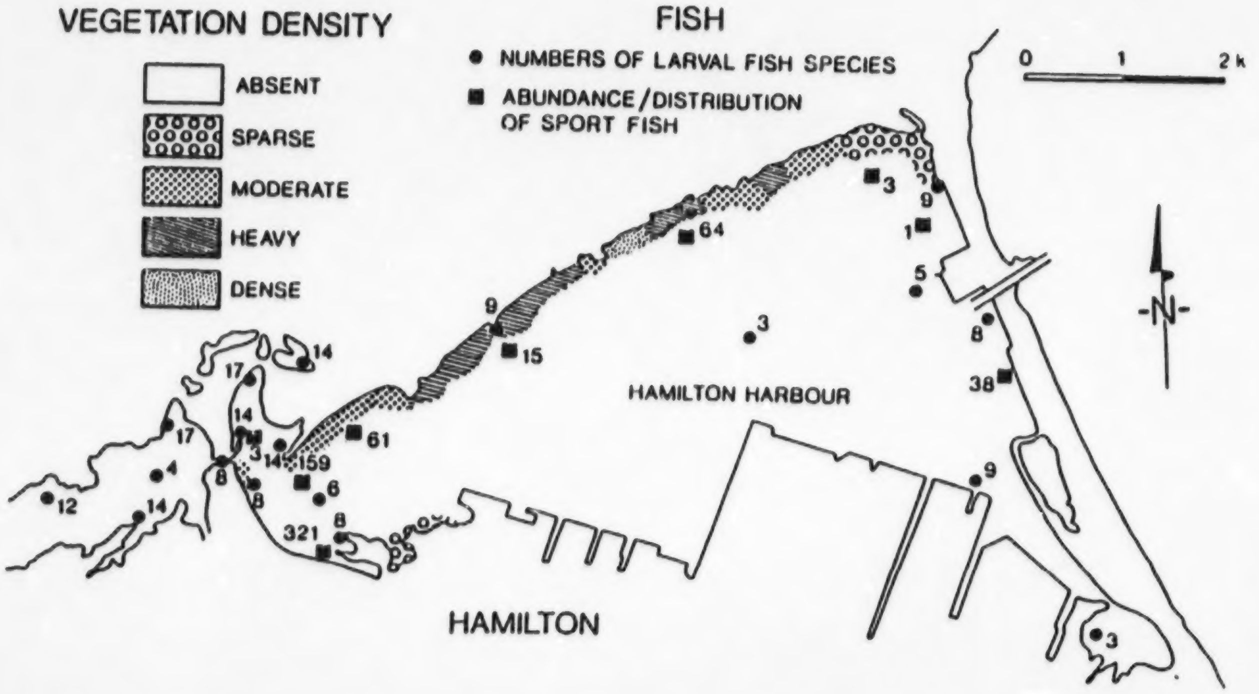


Figure 8

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

In the past the Woodward Avenue STP, which is responsible for the treatment of sewage coming from some 300,000 users, did not comply with Provincial standards with respect to phosphorus emissions.

> "In 1987, the major source of phosphorus loading into Hamilton Harbour was the Hamilton STP (290 kg/day, 56%). Combined Sewer Overflows discharged about 78 kg/day (16%), the Burlington STP contributed 40 kg/day (8%), and the steel industries about 10 kg/day. Other sources of phosphorus loading include creeks. Phosphorus in the creeks is believed to be mostly due to soil erosion from construction sites, stream banks and farm land." [p.101, 1989 RAP]

Other figures suggest that, throughout 1987, the total phosphorus loading from the Pollution Control Plant to Windermere Basin was closer to 276 kg./day. During the summer of 1988, the addition of pickle liquor to the plant process immediately decreased the concentration of phosphorus in the effluent. The ongoing dosing of pickle liquor to the wastewater treatment process has maintained a very low effluent phosphorus concentration on a continuous basis. Although plant flows have increased since 1987, the daily phosphorus loading has actually decreased to 124 kg per day in 1989, which is less than half that of two years previous.

Eutrophication still appears to be a problem in certain parts of the Harbour. In these areas the water clarity and oxygen levels are reduced, and aesthetic problems arise such as fouled beaches and rocks. In the deeper areas of the Harbour eutrophication has almost destroyed the coldwater fishery. The makeup of the fish species found in the Harbour has changed substantially since the introduction of phosphorus into the Harbour environment. (See Figure 9)

Ammonia

Cold water slows down the oxidization of ammonia. Ammonia builds up during the cold winter months but is rapidly oxidized in the warm summer months. Thus, concentrations of ammonia in the Harbour are greatest in the early spring and lowest in the summer. A great deal of the ammonia discharged into the Harbour is flushed out into Lake Ontario through the canal, but the capacity of Hamilton Harbour to absorb the ammonia without adverse effects to the aquatic environment is still much smaller than is presently demanded of it. (See Figures 10 and 11]

Ammonia results from the partial decomposition of wastes in STPs as well as from industrial processes. Ammonia contributes greatly to the lack of oxygen problem in the Harbour. Ideally, ammonia processing should take place in the sewage treatment plants, and not in the Harbour.

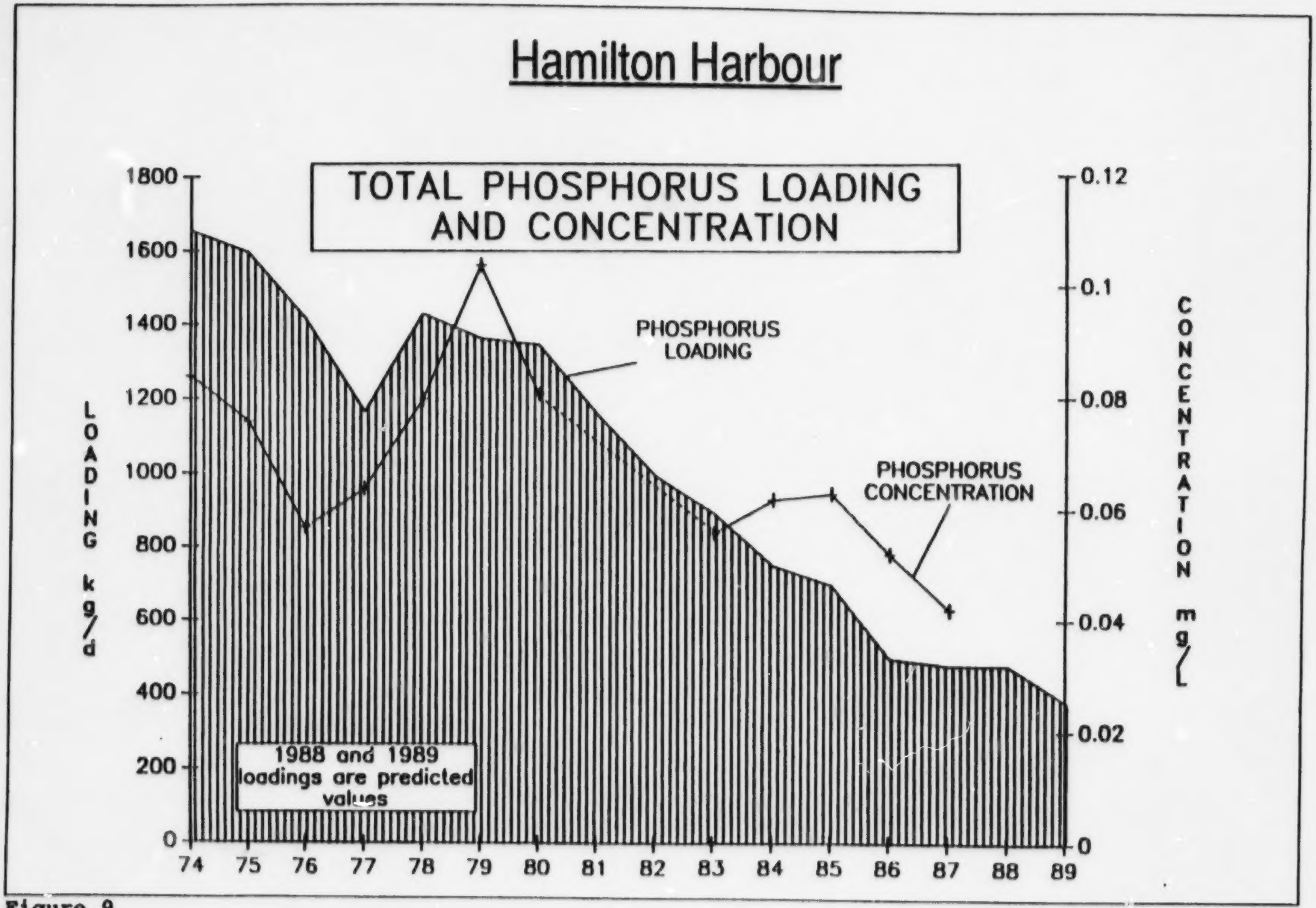


Figure 9

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

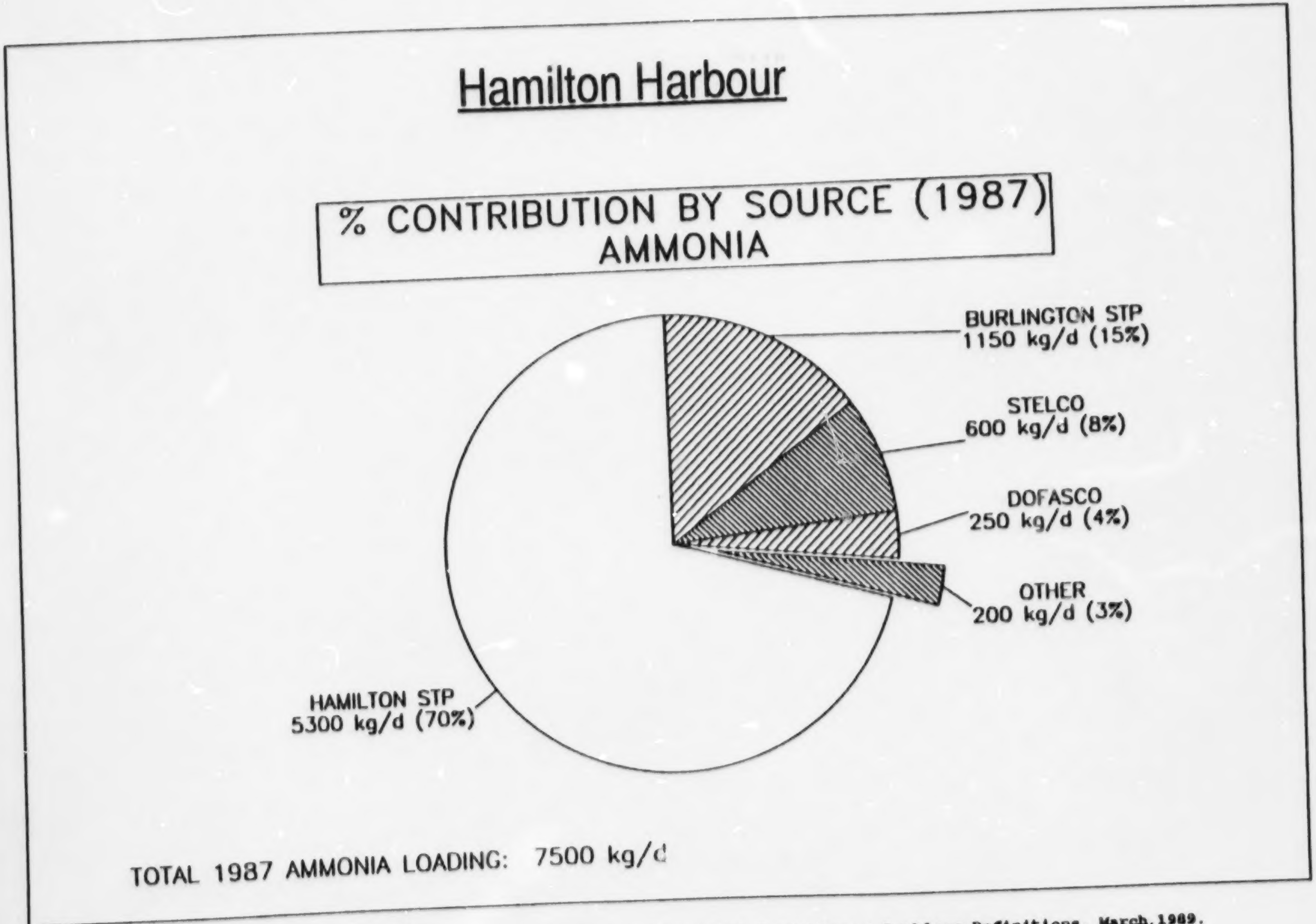


Figure 10
Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

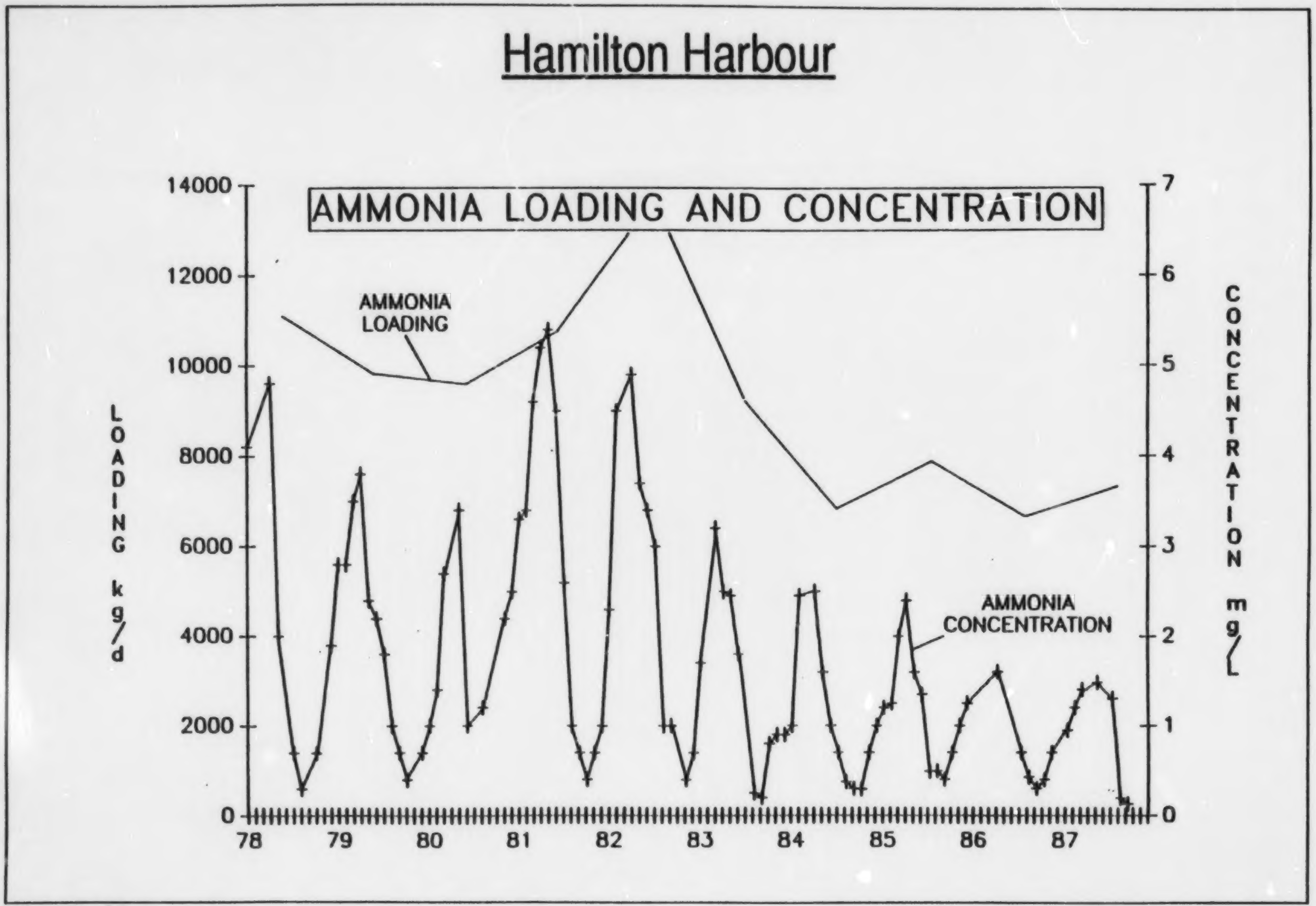


Figure 11

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

WATER

Loadings of ammonia to the Harbour have been greatly reduced in the past two decades as the result of a concerted effort on the part of Stelco and Dofasco. Industrial loadings have been reduced from approximately 24,000 kg/day to about 857 kg/day.

Until recently municipal loadings remained virtually constant. The Hamilton STP was the source of approximately 70 percent of the loadings in 1987, while the Burlington STP was responsible for about 15 percent of the ammonia dumped into the Harbour. It was estimated that ammonia discharges to the Harbour had to be halved to bring concentrations in the Harbour up to the standard of the Province's Water Quality Objectives.

Ammonia loadings from the Pollution Control Plant to Windermere Basin in 1987 averaged 5209 kg per day. Process control adjustments to initiate nitrification resulted in an impressive reduction of ammonia in the plant effluent. The ammonia loading from the plant during 1989 decreased to 2177 kg per day; a significant decrease of 58 percent over a two year period.

Suspended Solids

Area creeks carry the majority of the suspended solids into Hamilton Harbour. Approximately 31,400 kg/day or 63 percent of the total loadings come from creeks running into the Harbour. (See Figure 12 and 13]

The volume of discharges of suspended solids into Hamilton Harbour appears to be on the decline since the early 1980s, largely due to a marked reduction in industrial discharges.

The amount of suspended solids pumped into the Harbour from Hamilton's steel mills has declined from about 150,000 kg/day in 1967 to about 12,000 kg/day in 1987. Improvement is still possible for the steel industry. In 1987 Stelco was the second largest source of suspended solids discharge into the Harbour, at about 8200 kg/day or 16 percent of the total. In 1988 these discharges were reduced further as a result of a rerouting of the Oil Recovery Plant effluent to the Eastside Filtration plant.

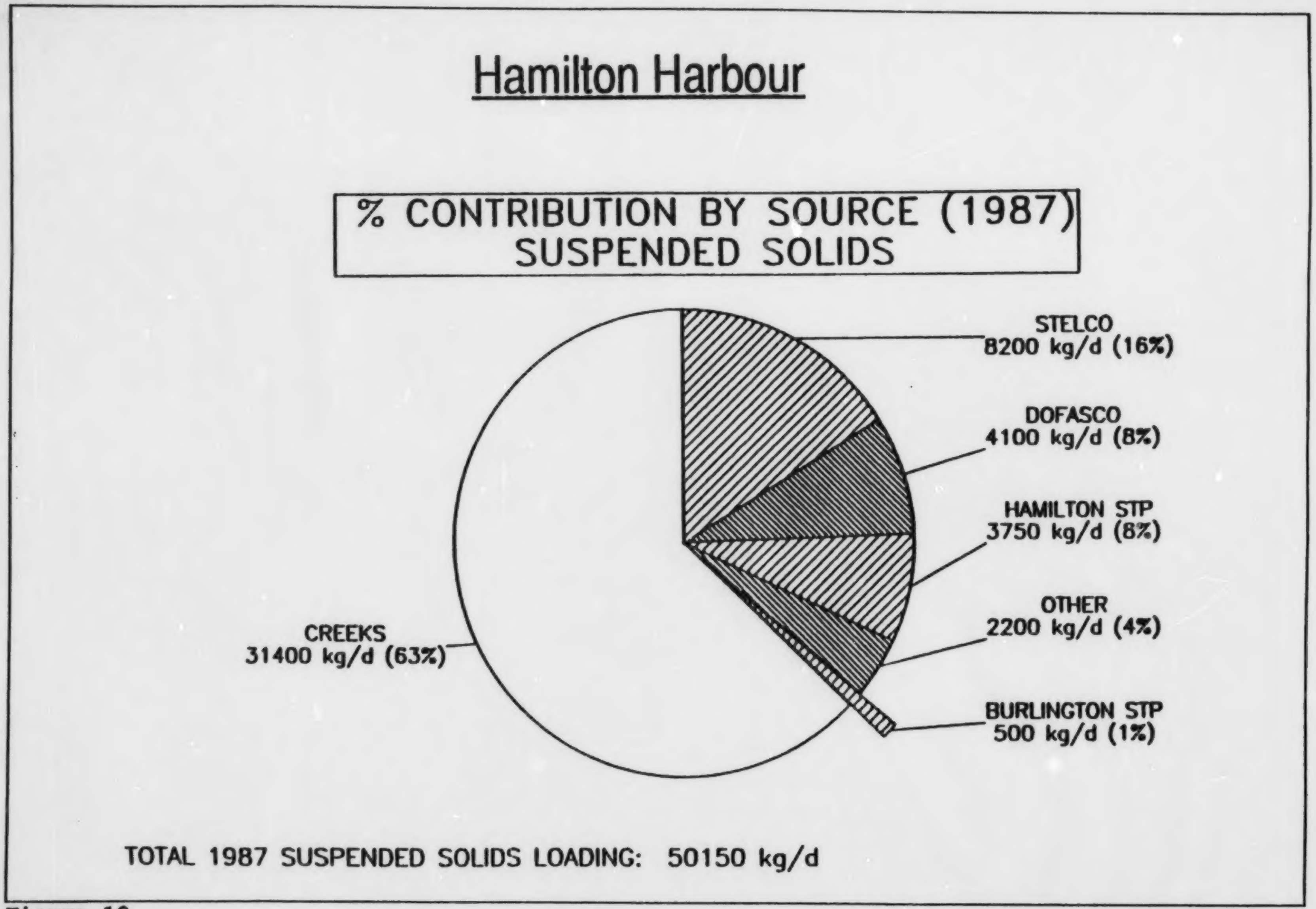


Figure 12

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

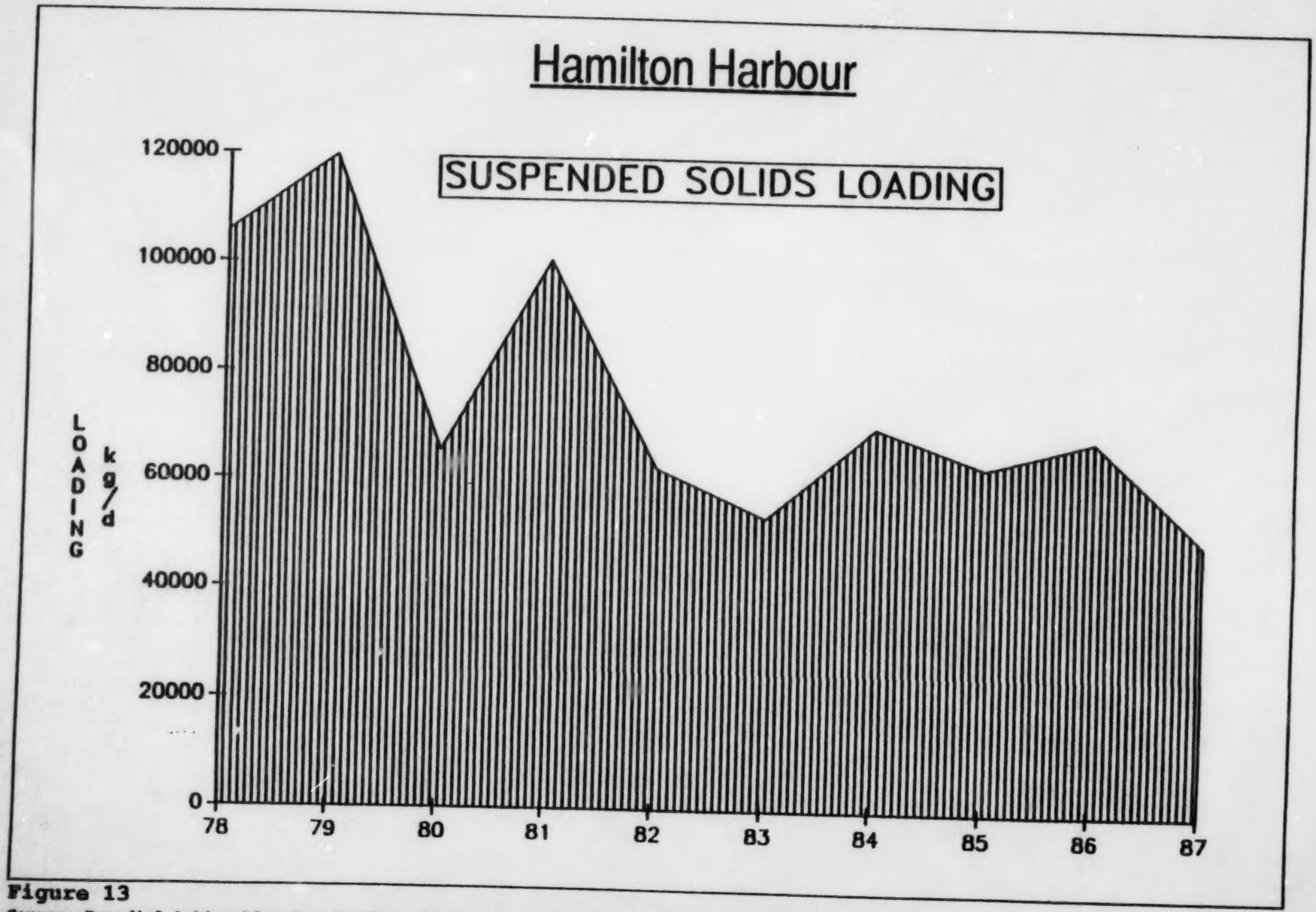


Figure 13

Source: Remedial Action Plan For Hamilton-Wentworth Harbour,Environmental Conditions & Problems Definitions. March,1989.

WATER

Cyanide

The reduction of cyanide loadings into Hamilton Harbour over the past decade and a half has been one of the more obvious successes in the improvement of water quality in the Harbour. Cyanide loadings have declined substantially since 1973, largely as a result of the largest polluters, Stelco and Dofasco, having implemented new technology to reduce cyanide emissions.

> "In 1987, Stelco discharged 119 kg/day (64%) and Dofasco 65 kg/day (35%) of cyanide into Hamilton Harbour. With completion of further control works by Stelco in 1987 and 1988, the total cyanide loading to the Harbour is expected to be 70 kg/day. Further control works being installed by Dofasco in 1988 and 1989 should reduce the total cyanide loadings to less than 50 kg/day."[p.104 1989 RAP]

(See Figure 14)

Iron

Iron loadings discharged to the Harbour have declined steadily since the 1970s, when the steel companies began to install pollution control equipment. Iron loadings have fallen from a high of about 20,000 kg/day to 4,000 kg/day. With the reduction in emissions from the steel industry, iron loadings from adjoining creeks have increased in terms of percentage of the total to approximately 20 percent. Hamilton Harbour now meets Provincial standards for iron concentrations. (See Figure 15)

Zinc

Zinc loadings to the Harbour have declined substantially since the early 1980s, when zinc concentrations were reaching critical levels. Use of pollution abatement technology by Stelco and Dofasco has led to a decline in zinc discharges into the Harbor from approximately 800 kg/day to approximately 100 kg/day. The zinc concentration level in the water has dropped from 0.05 mg/l to 0.013 mg/l. This level is well below Provincial guidelines. (See Figure 16)

Phenols

Like many of the pollutants identified in the 1970s and early 1980s as byproducts of steel manufacturing, discharges of phenols from Dofasco and Stelco into the Harbour has been successfully reduced using pollution-control equipment. Phenols loading has declined from approximately 2,600 kg/day to approximately 38 kg/day in 1987. The level of phenol concentration is now less than 0.4 ug/l well within the Provincial water quality objective of 1 ug/l. (See Figure 17)

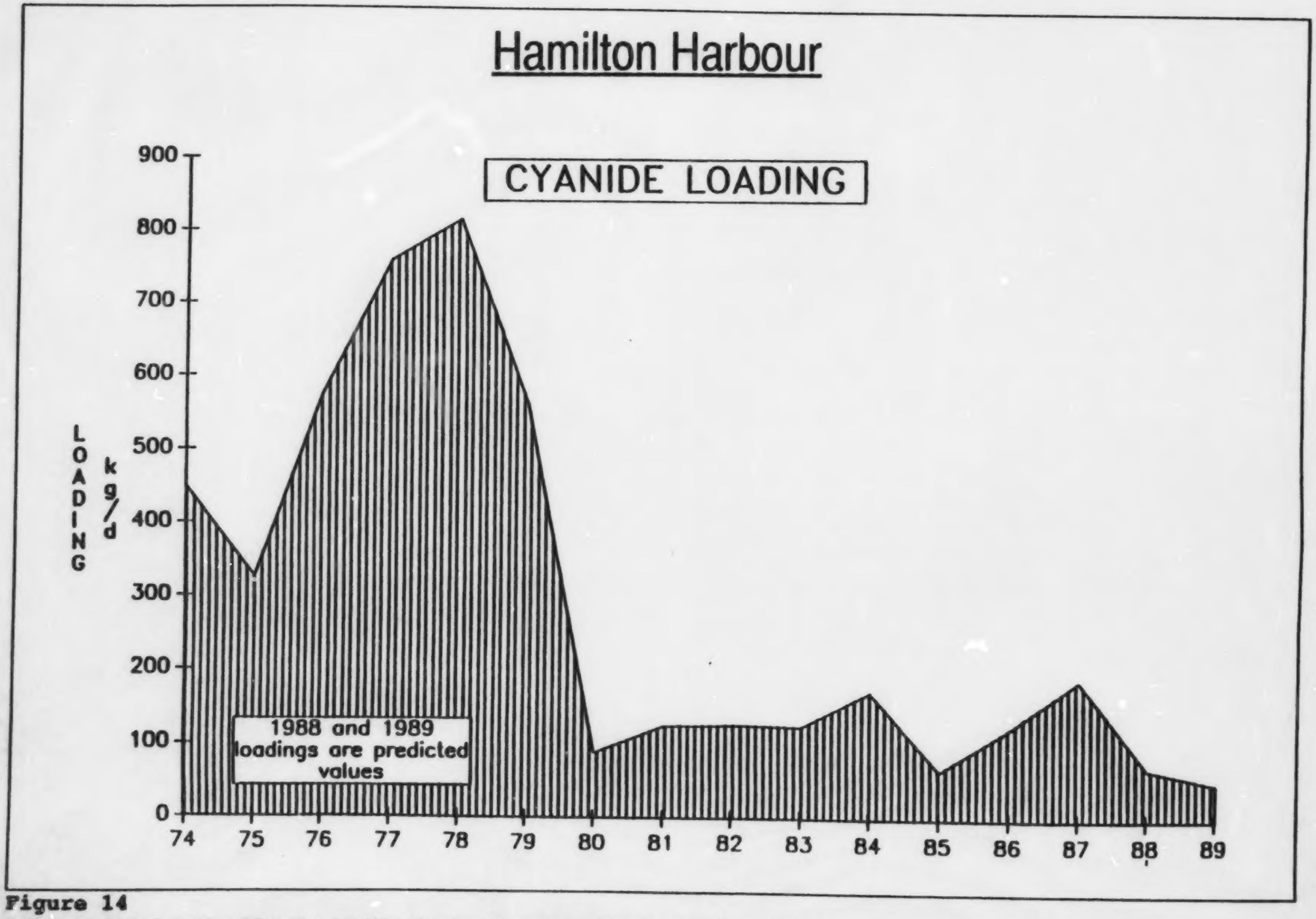


Figure 14

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

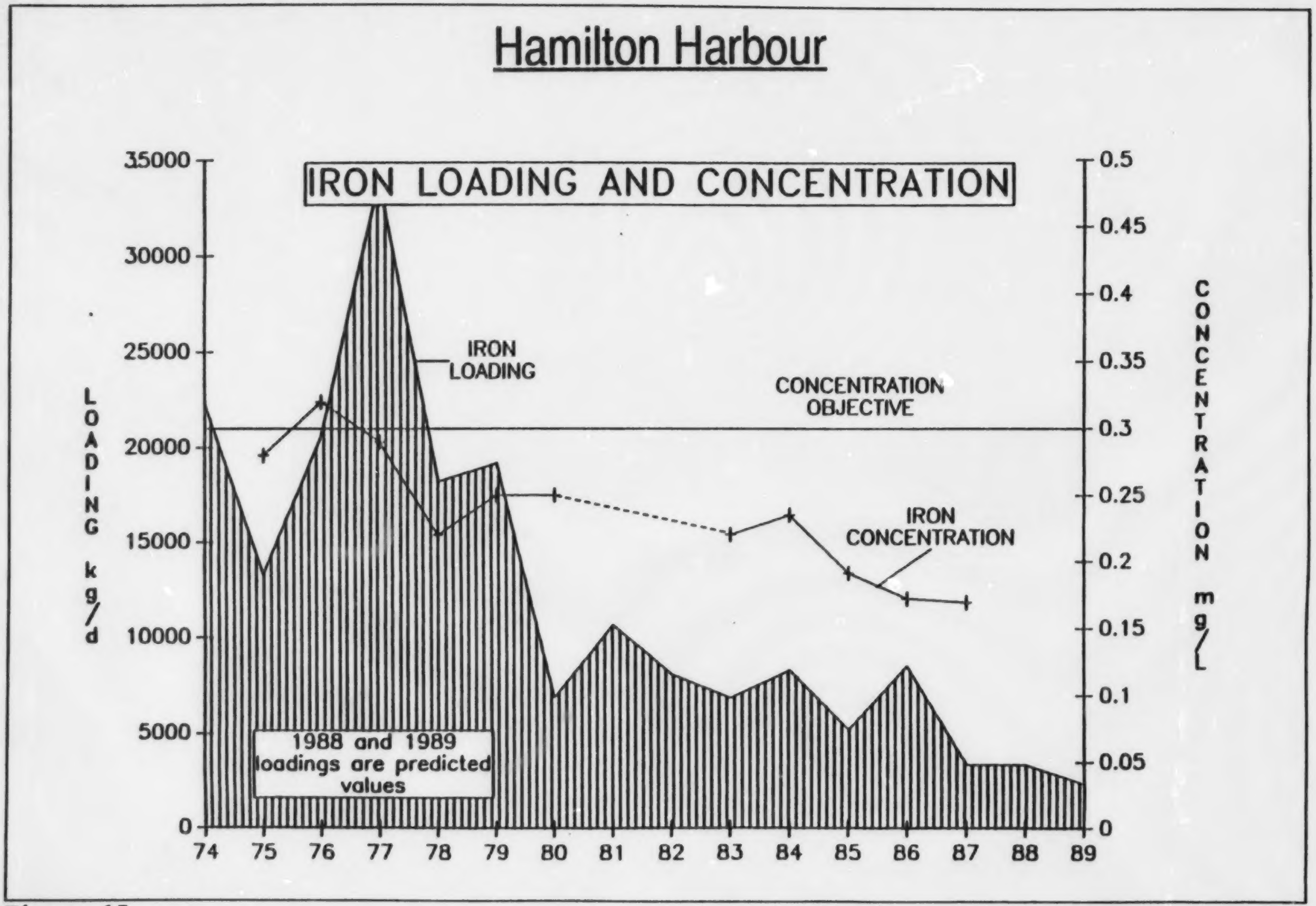


Figure 15

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

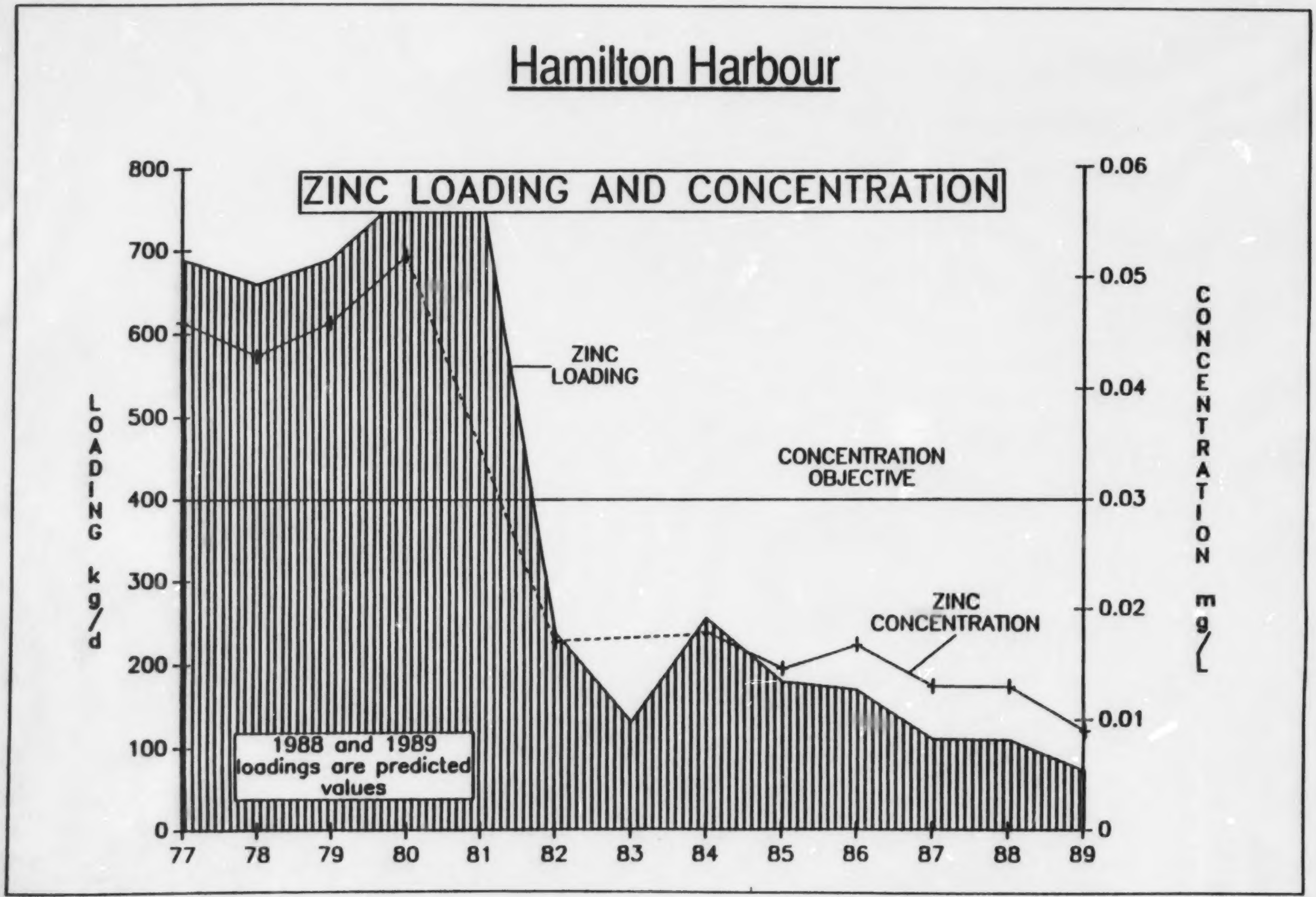


Figure 16

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

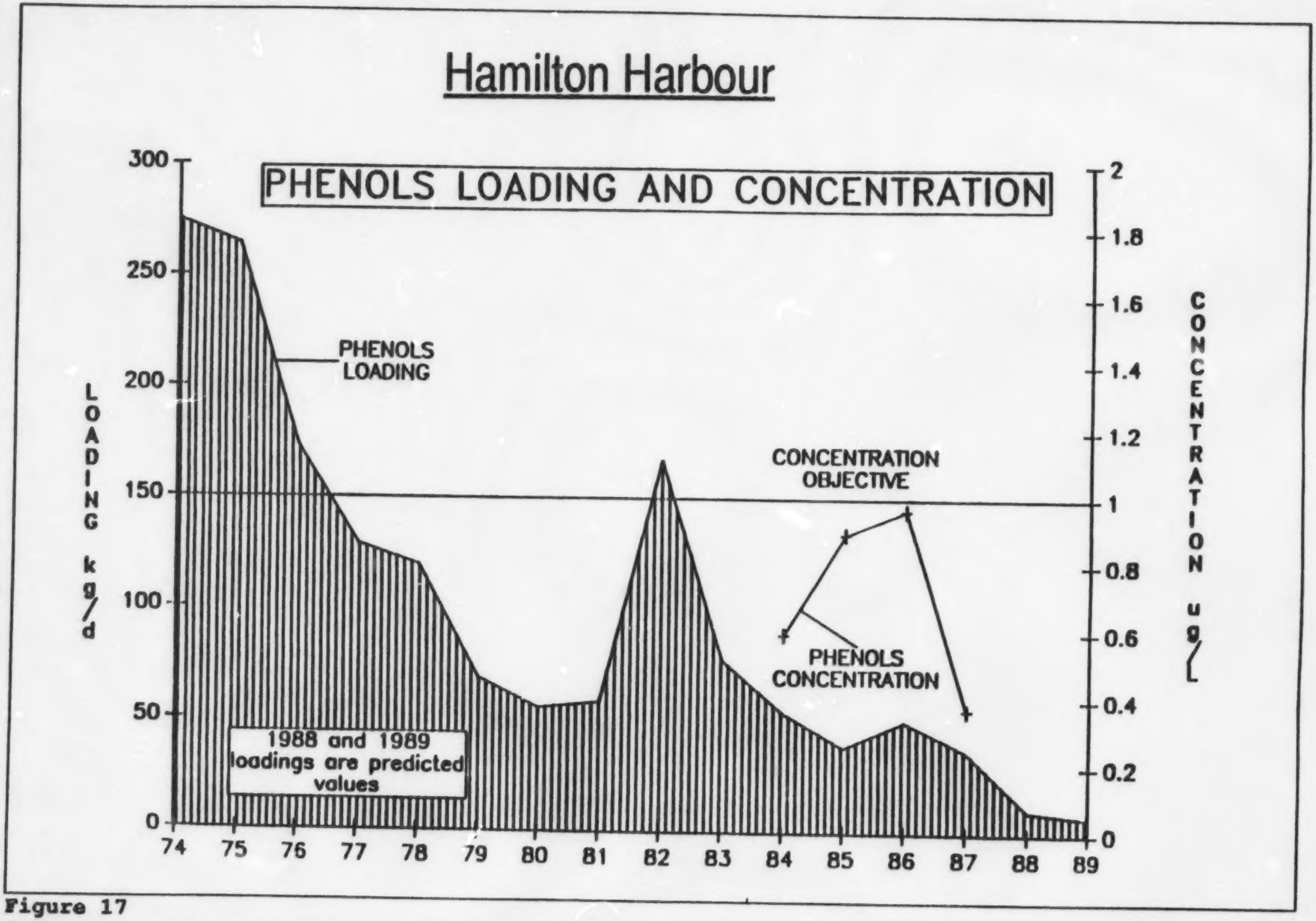


Figure 17

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

2.2.2.3 Pollution Trends in Hamilton-Wentworth's Creeks, Streams and Groundwater

Very little comprehensive work appears to have been done on consolidating information on the quality of water in Hamilton-Wentworth's streams, creeks and groundwater. Nevertheless, material on water quality in streams leading into Hamilton Harbour has been assembled through the Remedial Action Plan process.

This information indicates that the three creeks leading into the Harbour, Grindstone, Spencer and Red Hill Creek, discharge a substantial amount of suspended solids into Hamilton Harbour. These suspended solids were attributed to sheet, rill, gully, channel, in-stream, unstabilized stream banks, urban construction practices, road embankments, and excavations.

Creeks discharged approximately 31,400 kg/day of suspended solids into Hamilton Harbour in 1987, making up approximately 63 percent of the suspended solids discharges to the Harbour in that year. Reassessment of the sediment loading measurements since 1987 has cast some doubt on the discharge from Grindstone Creek. The exact figure for suspended solids loadings in the Harbour due to upstream activity can only be determined if a better sampling program is initiated.

A recent Ministry of Environment study found that despite Ontario guidelines for erosion control on construction sites only five percent of sites in the Hamilton Harbour watershed maintained adequate erosion control methods.

Apparently the amount of suspended solids flowing into Lake Ontario from streams is not perceived as being a problem, so specific studies have not been undertaken to study this type of pollution. However, the Remedial Action Plan implementation strategy includes expectations that land-use policies will be re-evaluated through the preparation of watershed studies and master drainage plans.

There are indicators that many of Hamilton-Wentworth's creeks and streams contain very high levels of bacteria that can be dangerous to human beings. A Ministry of the Environment study in 1979 found that Smith's Creek and Stoney Creek both had signs of extremely high levels of fecal bacteria. Discharges from these streams in times of heavy runoff polluted Lake Ontario to such a point as to make nearby beaches a serious hazard to swimmers. Little systematic testing of bacteriological pollution of the Region's creeks and streams seems to have taken place. Public Health Inspectors inspect beach areas on Lake Ontario but not streams.

WATER

Water quality problems are not limited to streams running directly into Lake Ontario. For example, through the period 1983 to 1986, Conservation Authority sanitary surveys of Ancaster Creek revealed that the water quality commonly fell short of Ministry of Environment Water Quality Guidelines. Contaminants exceeding guidelines included, fecal coliform, un-ionized ammonia, phosphorus, and chlorides. The presence of high fecal coliform counts suggests the presence of sewage and fecal matter. Chlorides are likely entering the stream due to road salting, municipal wastewaters, and industrial sources.

The Region is currently undertaking a multimillion dollar combined sewer overflow (CSOs) rehabilitation program. The CSO rehabilitation will address both discharges to streams (Redhill and Chedoke Creek) and discharges directly to the Harbour. The CSO program does not address the issue of existing open beaches on Lake Ontario. Swimming in the Harbour is generally prohibited. The CSO treatment and a check of the bacteriological quality of streams (and subsequent correction of identified problems in the streams) may make it possible to reopen the Harbour for swimming at some time in the future.

Hamilton-Wentworth has a substantial agricultural sector, and most of the Region's streams and the better part of the Region's groundwater supplies are located close to agricultural activities. The effect of herbicides and insecticides on the creeks, streams and groundwater is a concern for which Regionally specific study results are largely unavailable. Studies done elsewhere in Southern Ontario suggest that direct spills and equipment washing practices may lead to more well contamination than groundwater percolation. A Rural Beaches study covering part of the Region (Binbrook) has made headway in examining the implementation of improvements in farm practices that make for better water quality.

Watercourses in the Region are not systematically tested for pesticide or residual compounds. The one testing station, on an Ancaster creek, which is part of the province-wide pesticide residues testing program has not registered levels of pesticides in the water that are of concern to the Ministry of Environment.

In 1983 26,210 kilograms of Triazine, 9,270 kilograms of Phenoxy compounds, 19,450 kilograms of other insecticides, and 28,500 kilograms of fungicides were used by farmers in the Hamilton-Wentworth Region. Figures from 1988 indicate that the volume of pesticides applied to farm fields has dropped considerably. (See Agriculture section.)

Certain compounds, such as commonly used corn herbicides are much more persistent than the breakdown products of 2-4-D, ie 1-2 years versus weeks, and are therefore more likely to show-up in water. Most of the pesticides in use today are relatively short-lived compared to products like DDT which were taken off the market in the early 1970's when it became clear that they were bio-accumulating.

WATER

In part because of pragmatic considerations regarding cost-effective use of public funds, the MOE is of the opinion that increases in education and improved enforcement of existing Regulations will prevent misuse and abuse problems better than monitoring after the fact. The MOE licences all lawn spraying companies (not all the individual sprayers) and as of April 1991 will be certifying all farmers.

Chedoke Creek which runs near a defunct landfill site is tested once a year for contamination by leachate. An evaluation of possible containment measures for leachate has not been completed but leachate testing will be upgraded.

Testing for bacteriological contamination of rural drinking-water wells has been done by the MOE and the Region's Health Inspectors. Although some areas have experienced severe seasonal contamination problems there does not appear to have been any widespread problems of well contamination either through bacteriological or chemical causes. However, should development in the rural areas continue at the pace experienced in the last five years, the potential exists for pollution of existing groundwater supplies (particularly nitrate levels) by septic tank systems. Presently, the aquifer itself seems clean. The MOE has recently undertaken a testing program of water quality from wells in the Millgrove area as a result of concerns raised by a local resident. Many of the shallow dug wells which have experienced contamination will require repairs by the homeowners.

It is impossible to dismiss potential future problems related to contamination by pesticides or other toxic compounds because systematic testing of water for these chemicals across Hamilton-Wentworth has not taken place.

2.2.3 Continuing Issues

2.2.3.1 Sediments/Landfill in Hamilton Harbour

A problem often not associated with water pollution is that of polluted sediment and nearby landfill. Hamilton Harbour has been filled in and polluted to the point that the body of water itself is contained in a heavily polluted basin. Human alterations to the Harbour have resulted in the destruction of much of the aquatic ecosystem that was in place before Hamilton was settled.

A report by Hamilton Harbour's RAP taskforce summed up the huge changes to the Harbour caused by infilling of large sections of marshland and dredging of sediments. Formerly, the 43 km south shore was a complex marsh ecosystem colonized by emergent and submerged vegetation. The irregular shore line was full of inlets that in some cases created long bays extending more than one kilometer inland. Now there is no suitable fish habitat along the south shore of Hamilton Harbour east of the former Lax property. The eradication of fish breeding habitat along the south shore restricted the fishery to the north and west shores of the Harbour and to Cootes Paradise.

- from 1926 to 1976, 22 percent of the open water in the Harbour was lost
- a serious habitat loss to the Harbour was the extensive marsh littoral area
- present wetland area is estimated to be less than 50 hectares one-tenth the 500 hectares maximum
- landfilling reduced the total littoral shoreline from 65 kilometers in 1800 to 17.3 kilometers in 1985
- most of the south shore has been dredged to at least eight meters deep
- the landfilled shore is separated from the Harbor by steeply sloped berms or by vertical pilings providing no good fish habitat

Much of the shoreline is contaminated, but no inventory has been compiled so it is difficult to ascertain just how serious the problem is. The Lax properties, for instance, are very contaminated, and any rehabilitation of those properties could cost tens of millions of dollars. A coal tar deposit near Randle's Reef (close to Stelco property) contains many hazardous contaminants that may move and be absorbed by the fish and insects still living in the Harbour.

What is certain is that the sediment on the bottom of Hamilton Harbour is highly contaminated. This is a legacy of many decades of unrestricted industrial discharges, landfill operations, and runoff through creeks and streams. As the two maps show, (See Figures 18 and 19) sediment toxicity varies in different areas of the Harbour. Those areas closest to the industrial complex are the most badly polluted. Any attempt to dredge up the sediments and clean the Harbour bottom could be both financially prohibitive and environmentally-disastrous in the short term. If the bottom sediments are moved around, a large quantity of toxic material will be released in the Harbour's waters, killing much of the existing fish stock and releasing dangerous plumes of contaminated water into Lake Ontario through the canal. Recent reports suggest that it would take 30 years before the contaminated sediment in the Harbour would be covered with new, presumably less contaminated sediment.

Windermere Basin is an example of how further examination of the Harbour's sediments can lead to higher estimates of the toxicity of the Harbour basin. After undertaking an extensive study of Windermere Basin in the early 1980's, experts reported that the sediments analysed were so polluted that they greatly exceeded the levels tolerated by Provincial guidelines. PCBs in particular were seen as a problem:

> "The concentrations of PCBs in the Windermere Basin sediments were compared to the Ontario guidelines for permissible levels of PCBs in sediment (50 ug/kg) for open water sediment disposal. All Windermere Basin sediment samples were found to contain PCBs in concentrations that exceeded the guideline. The average concentration of PCBs in the sediment was reported to be 1241 ug/kg (i.e. 25 times the specified guideline). The maximum concentration of 3430 ug/kg was 68 times the guideline." (p.17, Windermere Basin Rehabilitation Project (Draft))

Studies have also suggested that much of the sediment on the bottom of the Harbour is highly toxic to the types of organisms that would normally live in such habitat. Many parts of the Harbour, especially on the south side and in the deepest parts, are now unsuitable to Daphnia Magna and Pontoporeia, a burrowing organism that is an important food for whitefish. Toxic sediments can continue to be a problem in aquatic environments in which man-made pollution discharges are no longer a major problem, since burrowing organisms and bottom vegetation can absorb the toxic materials and then send the toxic compounds up the food chain as fish feed on them.

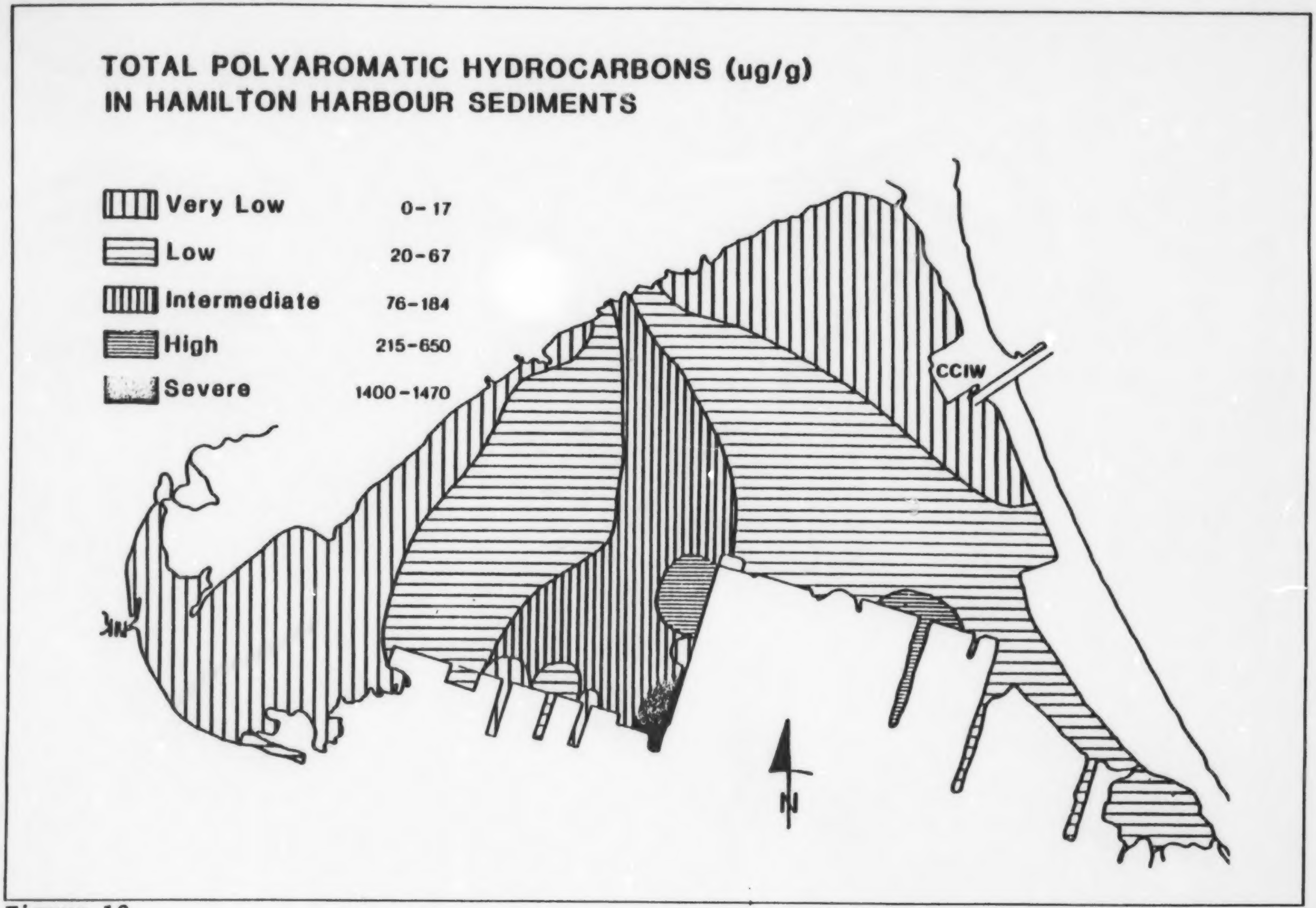


Figure 18

Source: Remedial Action Plan For Hamilton-Wentworth Harbour,Environmental Conditions & Problems Definitions. March,1989.

ZINC CONCENTRATIONS (mg/g) IN HAMILTON
HARBOUR SEDIMENTS

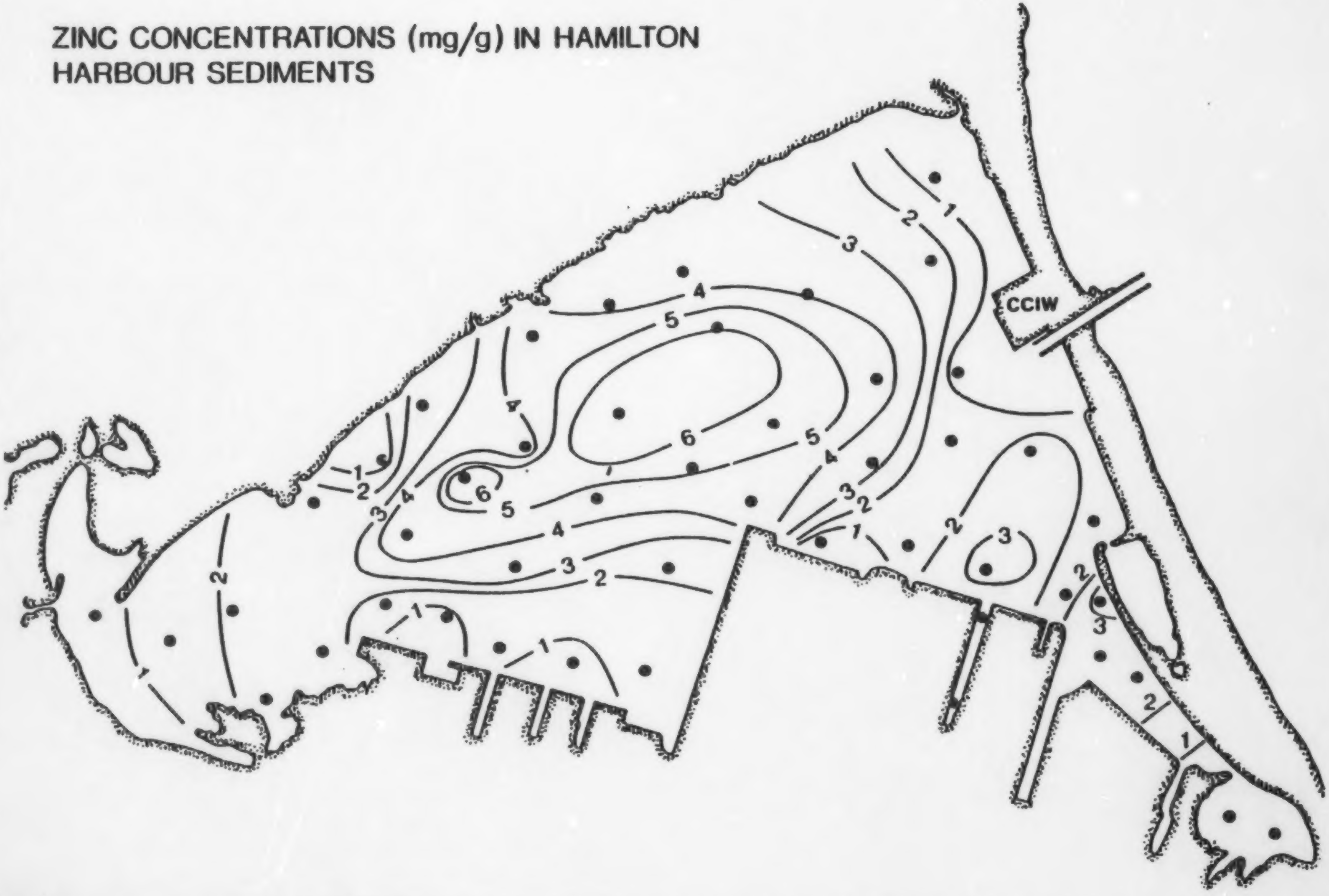


Figure 19

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

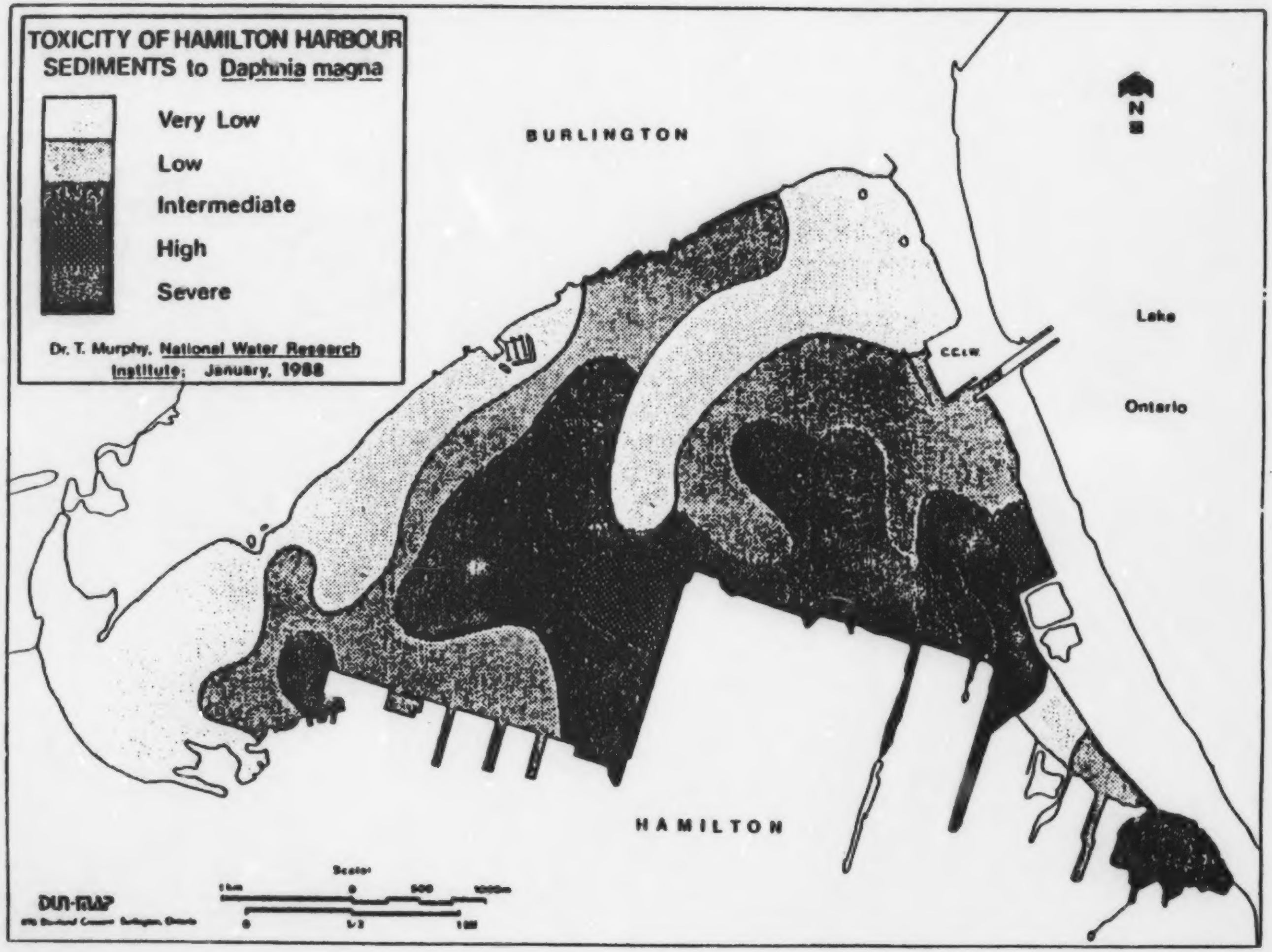

TOXICITY OF HAMILTON HARBOUR SEDIMENTS to Daphnia magna
Very Low
Low
Intermediate
High
Severe
Dr. T. Murphy, National Water Research Institute; January, 1988
BURLINGTON
HAMILTON
Lake Ontario
N
CCIW
Scale
DUN-MAP

Figure 20

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

2.2.3.2 Swimming/Recreation

The Region of Hamilton-Wentworth contains areas that would be well suited to swimming and other aquatic recreation, but bacterial pollution has eliminated many of these areas from the list of acceptable swimming locations. Some shoreline areas of Hamilton Harbour in particular would make an excellent water recreation area were it not for the high levels of pollution.

The recreational plans for the redevelopment of the Lax site envisage chlorinated pools seperated from the rest of the Harbour by semi-porous barriers. The waterfront development plans do not deal comprehensively with the effect such development will have on the water quality of the Harbour, nor with the immediate or long-term effect on fish habitat. This plan was prepared before the rehabilitation goals of the Remedial Action Plan had been prepared. Waterfront park plans are likely to be reexamined in the light of these goals.

In those parts of Cootes Paradise and Hamilton Harbour that still have shoreline that would be physically acceptable for swimming the major deterrent to aquatic recreation is the unsafe levels of bacteria as indicated by the amount of fecal coliform bacteria present in the water. The source of this bacteria is a combination of water discharges from the municipal STPs, combined sewer overflows, storm sewers, illegal sewer hookups, streams and creeks, and malfunctioning septic tanks, although it has not been determined which of these elements is the most important. Because of the high levels of fecal contamination present in the Harbour, swimming has been effectively prohibited since the 1930s.

Levels of bacteriological contamination presently vary greatly during the warmer months of the year, ranging from acceptable for swimming to completely unacceptable for swimming. The Regional project to deal with the problem of Combined Sewer Overflows will have a positive affect on fecal coliform levels but stormwater run-off will still enter the Harbour. This run-off could remain highly contaminated with animal feces that might also continue to result in unsatisfactory bacteriological water quality. Other measures would then be required to address the streams and their watersheds.

Swimming and other forms of aquatic recreation that entail contact with the water are allowed on the Region's Lake Ontario beaches when bacterial levels permit. The Department of Public Health Services has been forced to post warnings on these beaches over the past few decades. This Department has reported a declining trend in the number of postings, presumably because of the rerouting of a number of storm sewers into the sanitary sewer system in Stoney Creek and an elimination of sewage sources in the Hamilton Beach/Van Wagners Beach area. In 1985 there were 173 separate beach warning postings among the 15 beaches, there were only 25 postings in 1988 and 35 postings in 1989.

Storm sewers and creeks contribute significantly to the level of fecal bacteria found in beach area water, since these sewers and water courses are the primary conduits for animal fecal material that is washed from roads and farm yards into waterways and the lake.

2.2.3.3 Drinking Water

In Hamilton-Wentworth the vast majority of the population obtains its water from intake pipes located in Lake Ontario. The water obtained through these intake mechanisms from the lake are monitored by the Region's engineering department and these results are examined by the province under the Drinking Water Surveillance Program.

Hamilton-Wentworth's intake pipe is located far enough into Lake Ontario that plumes carrying polluted water from the canal leading into Hamilton Harbour usually do not reach the intake area. Studies have indicated that plumes eminating from Hamilton Harbour via the canal do not significantly affect the water intakes for either the Burlington and Hamilton water systems.

Hamilton's water treatment plant (WTP) utilizes several processes to eliminate undesirable elements from the raw water it takes in from Lake Ontario; flocculation, coagulation, sedimentation, filtration, disinfection and fluoridation processes. These processes were not designed to remove chemicals. Nevertheless, some of the compounds that are found at extremely low levels in raw water samples (PAH, specific pesticides) do not show up in the treated water used as drinking water. Most importantly, Hamilton's water treatment plant, which serves a population of over 400,000 people, produces drinking water that passes all of the Province's health-related guidelines.

Both raw and treated water samples are checked routinely by the Region's Engineering Department. The Province reviews that data, but also carries out its own sampling and water analysis program to check water quality for about 150 different chemicals. Toxic contaminants have not been detected in Hamilton's raw water supply at levels higher than permited under existing water quality guidlines, and usually are not even present at levels that are detectable. The Water Quality guidelines are currently under review. Concerns have been raised about the levels set for Trihalomethanes (THMs), which are formed when water with organic materials in it is treated with chlorine to kill bacteria.

WATER

Due to inadequate information or a lack of identified solutions items of on-going concern regarding the drinking water of the population of Hamilton-Wentworth are:

1) contamination of groundwater sources used by the rural population either by sewage or chemical pesticides and fertilizers, and

2) the potential contamination of Lake Ontario water by seepage of highly toxic materials from leaking storage sites in the Niagara area into the Niagara River and Lake Ontario.

One potential danger to the drinking water of Hamilton-Wentworth's residents in rural areas unserviced by Regional water lines is seepage of petrochemicals from underground storage tanks into groundwater. Most publicity given to fuel tank leaks in Ontario has been related to the potential for explosions resulting from build-ups of highly-combustible gasoline fumes building up in floor drains and sewers. However, with approximately 50,000 unprotected buried tanks in Ontario (that are known of), the contamination of groundwater by an oil or gasoline leak from an old buried storage tank remains a distinct possibility. In fact, a buried gasoline tank at the corner of Mohawk and Garth Streets has leaked and fuel is being pumped from the ground. Nearby homeowners have experienced fumes and odours.

The Province has required every owner of a tank installed prior to 1974 to give each tank anti-corrosion treatment, i.e. replacement or recovering the metal tanks with fibreglass materials. The deadline for this treatment is December 1990.

Because the majority of large Canadian urban areas are able to obtain their water supplies from rivers or lakes, little attention is paid to the capacity of buried fuel tanks to contaminate large numbers of groundwater wells. One litre of gasoline can contaminate over a million litres of drinking water. Methods of combatting groundwater contamination through delayed intervention are both costly and often ineffective. As a result, most European countries have very strict regulations concerning fuel tank leakage and petrochemical spills. Gasoline stations must regularly reconcile delivery and sales records so as to ensure that leakage is not taking place, and new underground tanks must be certified as being corrosion-resistant. Attempts are made at identifying old tanks and digging them up to ensure that long-forgotten fuel storage tanks do not contaminate future groundwater supplies.

2.2.4 Vegetation/Fish/Wildlife in Hamilton Harbour

Decades of landfill, high levels of pollution discharge, the introduction of exotic fish, and a change in the level of nutrients entering the water have had a devastating effect on many of the types of organisms previously found in Hamilton Harbour. Vegetation in the Harbour has undergone substantial changes since the arrival of settlers in the area. A combination of the process of eutrophication (increased levels of algae) and the increase in the level of suspended solids has led to a situation in which light rarely penetrates much beyond a depth of two metres in nearshore waters. As a result submergent vegetation in water deeper than two and a half metres of water is rare. Certain types of fish not native to the Harbour, such as Carp, stir up the sediment and uproot plants in shallow areas while feeding and spawning, leading to a further increase in suspended solids in the water and a resultant decrease in light penetration and vegetation growth.

Submergent aquatic vegetation now appears to be concentrated primarily along the northern and western shorelines of the Harbour. This concentration is largely a result of the unfavorable conditions presented by the dredging and steep slopes found in the southern areas, ie the absence of littoral zones along the shores. To a large extent the number and variety of underwater vegetation in Cootes Paradise and Hamilton Harbour has been diminished substantially since the growth of urban, industrial and port activities adjacent to these waters.

In Cootes Paradise studies have indicated that the number of resident submergent aquatic plant species that can be identified has declined from 24 for the years 1946-48 to only 4 in 1987. In Hamilton Harbour, five types of aquatic vegetation that adapt well to eutrophic environments now predominate: Elodea canadensis, Vallisneria americana, Heteranthera dubia, Myriophyllum Spicatum, and Potamogeton pectinatus.

The situation with regard to fish has been just as unfortunate. Most types of long-lived coldwater predator fish have disappeared from the Harbour, and have been replaced by short-lived foraging fish that are more tolerant of pollution and lower oxygen levels. At one time cold water lake herring and lake trout were commonplace in the deeper parts of Hamilton Harbour during June and July; now acoustic surveys indicate that there are almost no fish in the Harbour below 10 meters. Limits on improvements in the diversity of species found in the Harbour are varied. The Harbour is still relatively eutrophic, has limited vegetation, has very high levels of ammonia and other chemical pollution, and now has a shoreline unconducive to spawning for many species of fish.

WATER

The Harbour still supports a relatively diverse array of fish, including at least 59 different species. Nonetheless, the gradual elimination of larger, long-living predator fish and replacement by those types of fish that live off of vegetation, sediment organisms and plankton over the past century has occured. The result has been a diminished aquatic ecosystem:

> "The 1985 fish community in Hamilton Harbour and Cootes Paradise was dominated by warmwater planktivorous, herbivorous, and benthivorous species. Alewife, White Perch, and Gizzard Shad represented 92 percent of the total catch in Cootes Paradise (52, 32, and 8 percent respectively) and 71 percent of the Hamilton Harbour catch (56, 15, and O.1 percent, respectively). Differences in species composition reflected the presence of migrating species into Hamilton Harbour from Lake Ontario and reduced numbers of carp and Gizzard Shad in the Harbour. Large piscivores such as pike, garpike, Largemouth and Smallmouth bass, Channel Catfish, and bowfin were rare. The total number of fish captured in Hamilton Harbour and Cootes Paradise was similar although Hamilton Harbour received 30 percent more fishing effort."(p.86, RAP 1989)

The destruction of the marsh lands on the southern side of the Harbour has obviously changed the local ecosystem dramatically by reducing the number and diversity of fish, amphibians, insects and small mammals in the area. This in turn affected the size and diversity of the local bird population in a profoundly negative way. It has been estimated that of a possible maximum of 500 hectares of marshland in the early 1800s, only approximately 50 hectares remain. (See Figure 21)

The marsh vegetation and the warm effluents discharged by the Hamilton Sewage Treatment Plant that flow from Red Hill Creek into Windermere Basin are factors that make the area attractive to wildfowl. Studies done in 1986 by the Canadian Wildlife Service indicate that in the autumn Windermere Basin is on average home to 1860 birds, while in winter the number more than doubles to 4650 birds per count. Though contaminated, the sediments in Windermere Basin are organically rich and support a high density of benthic invertebrates which are a good food source for many types of shorebirds and ducks. Although pollution levels appear to be leveling off or declining for many types of compounds, wildlife is still showing signs of accumulation of toxic materials.

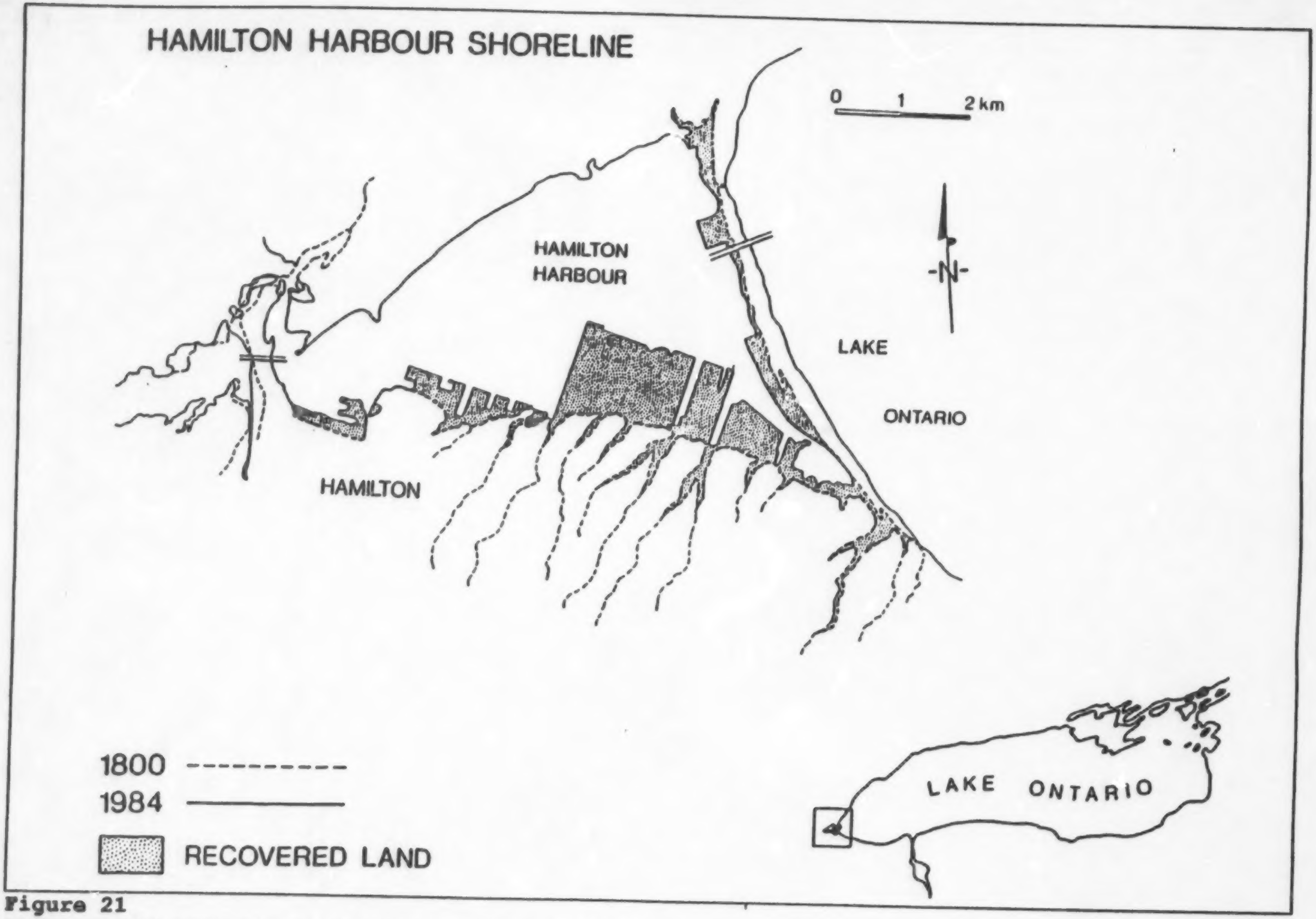


Figure 21

Source: Remedial Action Plan For Hamilton-Wentworth Harbour, Environmental Conditions & Problems Definitions. March, 1989.

Most of the population is comprised of Mallards, Black Ducks and Gadwall. Significant species found throughout the winter in the Basin are, the Green-Winged Teal, Northern Pintail, Northern Shoveler, Redhead, Hooded, Meganser and Rudy Ducks. A co-operative project for rehabilitating and improving the appearance of Windermere Basin is proceeding. After the construction and landscaping is completed the Basin is expected to be a better sediment trap, preventing sediments from washing into the Harbour. The long-term effects on the bird populations there are unknown. For the time being Terns are favoring the dykes for nesting spots.

A wide variety of birds also use Hamilton Harbour and Cootes Paradise year-round. Canadian Wildlife Service waterbird surveys in the autumn of 1985 and 1986 revealed that an average of 1200 birds were counted per survey. The majority of these birds concentrate in the northern and western parts of the Harbour. Most of the over 40 species found in Hamilton Harbour avoid the stretches of water in the middle of the Harbour and along the industrial and residential shorelines. Several species of waterfall and other birds unusual to the area can be found in Cootes Paradise, and many types of migratory birds stop over there at some point during the year.

A significant number of turtles and frogs continue to survive in and around Hamilton Harbour and Cootes Paradise. Although several other species are present, the American Toad and the Northern Leopard Frog are the most abundant type of amphibian. Among the turtle population the most common types are the Midland Painted Turtle and the Snapping Turtle.

The effect of high pollution levels on the frog and turtle population are still largely not understood. A study aimed at tracking the effects of organochlorine compounds on Snapping Turtles in Hamilton Harbour indicates that the turtles were significantly more contaminated with HCB, &-chlordane, pp'DDE and trans-nonachler (all derivatives of pesticides) than Snapping Turtles from Long Point, Algonquin Park and Cranberry Marsh. Hatching deaths appeared to be much greater in the Hamilton Harbour sample than in samples from other areas, but the incidence of deformities in the Hamilton Harbour group was no greater than in the other groups.

There has not been a great deal of work done on how the various toxic materials found in Hamilton Harbour and connected water bodies actually affect waterfowl and other birds. The few studies that have been undertaken in the 1970s and 1980s indicate that although birds have absorbed more toxic materials in Hamilton Harbour than they normally would in another geographical location, the level of toxic compounds in their bodies has been declining or has remained the same over the past ten years. One study has indicated that the amount of PCBs and Mirex in Herring Gull Eggs has declined considerably between 1981 and 1986.

WATER

A recent invader of the Great Lakes is the Zebra Mussel which presumably entered the lakes in the bilge water released from a foreign freighter. The mussel is much smaller than the native fresh water mussel but lays up to 40,000 eggs each. The Zebra mussel is colonizing the habitat of our native mussels. People who move boats from lake to lake are being asked to take extra precautions to ensure they do not transport mussel contaminated water or mussels on their hulls. These mussels are having drastic environmental impacts on water clarity, fish spawning beds, plankton availability, and the distribution of nutrients. Population levels of many species are likely to be effected. As the mussels spread they are expected to cause as much as $ 5 billion dollars damage to pipe intakes in the Great Lakes. They can clog valves of intake pipes and stick like glue to walls of smaller pipes. Treatment of the animals in pipes consists of chlorination or more benign options like carbon monoxide or heat.

2.2.5 Liquid Waste and the Regional Sewer System

Some people dump liquid waste into the sewer system without a thought as to the consequences. However, the sewage treatment process that "treats" their waste does not remove most of the toxic household materials. Many industrial and commercial firms routinely or occasionally discharge hazardous substances into the municipal sewage system. These substances very often continue on through the sewage treatment plants' processes intact and end up in the Great Lakes. This situation is repeated all around the Lake. In the long-run our common water sources become polluted and unusable, and our fish and wildlife resources dissipate.

Virtually all industries produce some kind of liquid waste or byproduct that must be reused, recycled or disposed. Those industries that discharge directly into lakes, rivers and streams are regulated individually by the Ministry of the Environment. Industries that discharge into municipal sewage systems in Ontario have not been subject to comprehensive inspection or analysis by either the province or municipalities. Individual industries known to be severe polluters have been charged under provincial environmental regulations and municipal sewer-use bylaws. Until recently no standardized system of discharge testing at the industrial site was put into place and enforced.

The Municipal Industrial Strategy for Abatement (MISA) a new provincial program is now being implemented in Hamilton-Wentworth. Under the program the discharges of individual industrial firms into the Regional sewage system will be examined.

The number and quantities of chemical compounds, petrochemical byproducts, organic and inorganic wastes, and suspended particles presently being discharged by Regional industrial enterprises are too diverse and extensive to be readily identified, let alone tested, by municipal engineers at the sewage treatment plant location. For many years, municipal STP employees were concerned only with loadings of ammonia, phosphates and suspended solids, largely as a result of the lack of solid provincial directives or regulations demanding greater levels of analysis. However, an increased level of awareness of the effects of toxic pollution have led to provincial and municipal environmental staff estimating the extent of a wide range of loadings to Hamilton Harbour, the receiving body for Hamilton-Wentworth's and Burlington's treated sewage.

For instance, Regional engineers have been involved in testing for the following loadings being emitted from the Region's sewage system:

Cyanide
Phenols
Phosphorus
NH3-N
Arsenic
Cadmium
Chromium
Copper
Iron
Manganese
Nickel
Lead
Selenium
Zinc
Oil
PCBs
y-BHC
DDT
Dieldrin
Endosulfan
Mirex
Chlordane
Pesticides
PAHs

These types of pollutants can have a profoundly destructive effect on aquatic vegetation, fish, drinking water, and water recreation.

Provincial water quality objectives identify a wide range of materials and compounds that can contaminate raw sources of drinking water in even very small quantities. Included in this category are radioactive materials like radium and strontium, heavy metals like mercury, and a wide assortment of industrial organics and pesticides. Other compounds and materials may not be so poisonous, but can create extreme problems when accumulated in large quantities. Excessive loadings of phosphorus into a body of water, for instance, often leads to a decline in oxygen levels and the death of large aquatic life once the process of eutrophication sets in. Phosphorus is present in most consumer detergents and in many industrial discharges, and as a result virtually all of Ontario's municipal sewage treatment plants have a problem with the quantities of phosphorus they have to treat or allow into receiving water bodies.

Most households empty chemical cleaning materials, dishwasher and clothes-washing detergents, soaps and shampoos, and toilet-bowl cleaners into drains and toilets. As a result of ordinary washing and cleaning activities in the home many types of household chemical compounds go down the drain into the municipal sewage system. The sewage treatment plant was not designed to remove these chemical compounds from the waste stream. Many people may be ignorant of the role household contaminants play in the pollution of the environment. The efforts of environmental groups and municipal campaigns to make people aware of the consequences of household wastes can change this lack of awareness.

WATER

The difficulties inherent in dealing with excessive levels of biological waste from households pales in comparison with problems created by toxic chemicals discharged into the sewer system in the form of industrial byproducts or household cleaning materials. Relatively small quantities of highly toxic materials are almost impossible to isolate, and when these chemicals can be removed from the sewer system the processes involved are often prohibitively expensive. In some cases the sewage treatment plant can filter out the better part of the pollutant once the problem has been detected. In many other cases the treatment plant is unable to initially detect or unable to take remedial actions because of the nature of the pollutant. Small quantities of very dangerous materials like Cyanide or PCBs can contaminate large quantities of water but still be hard to detect or isolate. For this reason, it is far easier to avoid discharging these types of materials into the sewage system in the first place, than it is to try to remove these contaminants once they have become mixed with the huge volumes of sewage moving through the system.

Accurate records showing the types and volumes of different forms of pollution being dumped into the sewage system before 1987 do not exist. Thus, it is difficult to be specific about just how severe the problem is and whether or not the situation is getting worse. Records have been kept on the discharge of ammonia, phosphorus and suspended solids. Also on record, is the total discharge of wastes into Hamilton Harbour from the Woodward Avenue and Dundas plants. It is difficult to infer from this data just how extensive the problem of liquid waste is because of the lack of records on toxic material discharges to the sanitary sewer system.

On average over 7,000 kilograms of contaminants are discharged daily by the Woodward Avenue treatment plant that is located on Red Hill Creek. Much of this waste is ammonia, phosphorus, and other relatively non-toxic wastes collected throughout the system in Hamilton, Stoney Creek and Ancaster; however, a substantial amount of it will be toxic industrial and household chemicals or compounds. Until quite recently, no concerted attempt at determining just what compounds comprised this mixture of industrial and residential sludge was made.

The volume of industrial chemicals discharged into the sewage system regularly or accidently is unknown. Results from extensive testing in Hamilton-Wentworth under the auspices of the Municipal and Industrial Strategy for Abatement program that is being piloted in the Region and five other communities in Ontario should produce a substantial database on the true composition of the wastes being discharged into the sewage system. (See below.)

WATER

The role of government in the liquid waste problem:

The liquid waste problem, or more specifically the liquid sewage problem, is primarily the responsibility of the Regional Government. The provincial government, through the Ministry of Environment, sets guidelines and objectives for municipal sewage treatment, and often provides matching funds for capital facilities projects such as the expansion of existing municipal treatment plants. The Province of Ontario has for several decades worked in tandem with the Government of Canada to reduce the discharge of pollutants into the province's lakes and rivers. The Great Lakes in particular have been the center of regulatory activity because of the importance of the lakes as a source of drinking water to millions of people in both the United States and Canada and because of the recreational and aquatic resources.

Although the Region of Hamilton-Wentworth is primarily responsible for the physical management of discharges from the Hamilton area into Hamilton Harbour and thus Lake Ontario, regulations and advice are given by several administrative and advisory bodies. These bodies include the International Joint Commission, the governments of Canada and Ontario, and the Remedial Action Plan Stakeholders Group, which was established solely for the revitalization of the Hamilton Harbour area.

The Region of Hamilton-Wentworth has recently embarked on a new initiative that is intended to reduce discharges of dangerous wastes from the Regional sewage treatment plants. Because attempts at isolating and extracting the many different types of known dangerous materials and compounds at the Regional sewage treatment plants are both prohibitively expensive and often futile, a new joint provincial/municipal initiative was launched in 1989 that was intended to reduce discharges of pollution at the source. The Municipal/Industrial Strategy for Abatement (MISA) is the most comprehensive attempt to date to make industrial polluters reduce their discharges of waste into municipal sewers or adjacent rivers.

Conceived by the Ontario Ministry of the Environment and implemented by the municipalities of the province, the program is designed to ensure industries monitor and then reduce the volume of their discharges through the use of "the best available pollution control technology which is economically achievable"(BATEA). Under this program the province undertook to establish discharge guidelines for various industries and to produce a system of fines and regulations that would ensure compliance to these guidelines.

WATER

Although the program will eventually be implemented in all of the province's industries and municipalities, the Region is one of only six pilot municipalities that is now implementing the program. The province is paying approximately $450,000 dollars of the pilot project's costs while the Region will be picking up the tab for the remaining $1.2 million. As a result the Region's sewage treatment plant lab staff will be able to begin surveying local industries about the type of pollutants they dump into the sewer system and will begin to measure levels of various pollutants at different points in the system. Regional engineering staff will trace the original source of pollutants so as to ensure industries refrain from discharging illegal effluents into the municipal system and to encourage proper reporting of spills.

While in the past little concern was given to industrial polluters using the municipal sanitary sewer system as a conduit for their liquid toxic waste discharges, Regional employees are now empowered to track down and prosecute flagrant abusers of the sewer system using both the new Regional sewer-use bylaw and the regulations included in section 136 of the Environmental Protection Act. Under the terms of Bylaw No. R89-049, a bylaw to regulate the discharge of water and wastes into the sanitary, combined and storm sewer system of Hamilton-Wentworth, industrial firms are not allowed to dump any quantities of PCBs, pesticides, waste radioactive materials, or ignitable wastes including fuels. Certain elements such as copper, cyanide, arsenic and mercury are allowed only in very small quantities for each litre of wastewater discharged. Other criteria such as maximum levels of suspended solids, phosphorus, biochemical oxygen demand, phenols, and temperature were also included. Additional general clauses in the bylaw outlaw the discharge of any substance that could damage the health of receiving bodies. Thus, virtually any type of undesirable contaminant could be prohibited from the sewer.

The Lab Section of Hamilton's Sewage Treatment Plant has decided to concentrate on the 500 most probable large industrial polluters (of 2,000 local industrial firms), and has sent out surveys to these firms asking for information on their discharges. Unfortunately, to date only a minority of companies has responded, leaving it almost completely up to the Lab Section to identify which contaminants are coming from which industrial dischargers. With approximately 140 contaminants being monitored and many hundreds of industrial firms to scrutinize, the Labs Section will only be able to identify and restrain a portion of those industrial firms that regularly or accidently dump tonnes of toxic materials into the Regional sewage system. Nonetheless, the spectre of heavy government fines, bad publicity in the local media, and sewage investigators examining their discharges may encourage Hamilton-Wentworth's industrial firms to reduce discharges of dangerous and toxic materials into the sewers through their own initiatives.

One thing is certain, however, and that is that Hamilton-Wentworth will be devoting more and more resources into efforts to reduce the quantity and improve the quality of municipal discharges into Hamilton Harbour. Although the number of spills into the sewer system of highly undesirable materials probably has not increased in the past five years, the amount of resources the Engineering Department has allocated to mitigating the effects of these spills has increased by a factor of ten over the same period. With the introduction of the new sewer-use bylaw and the MISA program, spills discovered in the future will entail costs related not only to the isolation and disposal of the contaminants but also to investigative and administrative actions as well. Large accidental or occasional discharges of illegal materials into the sewer system will demand an investigation and possible charges under the Environmental Protection Act in much the same manner as small but continuous discharges of similar matter into Regional sanitary sewers.

Any successful attempt at significantly reducing the amount of environmentally-damaging wastes dumped into Hamilton Harbour will inevitably rely on at least the following three strategies:

1) The education of individuals in industrial firms that dumping toxic or dangerous materials into the sewer system is illegal.

2) The education of residents and commercial property owners that many household cleaning and maintenance products can become a critical source of pollution when concentrated in the quantities expected from a population the size of Hamilton-Wentworth's and the promotion of more benign alternative products.

3) Research efforts directed at developing means by which existing levels of discharges can be reduced through new technologies applied on-site at the sewage treatment plant.

WATER

INFORMATION SOURCES

"Council Not Given Facts on P&G's Eight Spills". Hamilton Spectator Mar. 19, 1990.

"City Councillors Want a Hotline for Spill Reports". Hamilton Spectator. March, 1990.

Cook, Stephen. "Deadline Nears on Underground Gas Tank Upgrading". Hamilton Journal. April 11, 1990.

Dunn, Peter. Personal Correspondence. Director, Lab Section, Engineering Department.

Envirosearch Ltd. Windermere Basin Rehabilitation Project: Initial Assessment for the Partial Dredging and Filling of Windermere Basin. Hamilton Harbour Commission, 1988.

Great Lakes Water Quality Board. 1989 Report on Great Lakes Water Quality. International Joint Commission, Oct. 1989.

Hamilton Harbour RAP Writing Team. Remedial Action Plan for Hamilton Harbour: Goals, Problems and Options Report. March, 1986.

Hamilton Harbour RAP Writing Team. Remedial Action Plan for Hamilton Harbour: Environmental Conditions and Problem Definition. March, 1989.

International Joint Commission. Fifth Biennial Report on Great Lakes Water Quality: Part II. 1990.

Israelson, David. "Ontario Takes Aim at Zebra Mussels" Toronto Star. May 1, 1990.

Jette, Martha. "Residents Must Wait for Water Survey Results" Flamborough News. May 9, 1990.

Marlin, Beth. "Chedoke Creek Contamination Fears Prompt Boost in Testing". Hamilton Spectator May 29, 1990.

Marlin, Beth. "Region Joins Hunt for Contaminants in Ontario Sewers" Hamilton Spectator. Nov.8, 1989

Marlin, Beth. "Household Sewage Eyed for Toxics" Hamilton Spectator, 1990.

WATER

Marlin, Beth. "Few Industries Answered Survey", Hamilton Spectator, 1990.

Marlin, Beth. "$1.2 Million Project Targets Sewage Plant Pollution", Hamilton Spectator, 1990.

Ministry of Environment. Drinking Water Surveillance Program: Overview Annual Report, 1987. Toronto: Queen's Printer, June 1989.

Ministry of Environment, Factsheet: Hamilton Harbour Water Quality Update. April 12, 1988.

Ministry of the Environment. Background on MISA. 1989

Ministry of Environment. Report on the 1987 Discharges from Sewage Treatment Plants in Ontario. Toronto: Queen's Printer, October 1988.

Ministry of Environment. Report on the 1987 Industrial Direct Discharges in Ontario. Toronto: Queen's Printer, October, 1988.

Ministry of Environment. Water Management - Goals, Policies, Objectives and Implementation of Procedures of the Ministry of Environment November, 1978.

Ministry of Environment, Water Resources Branch. Impact of Hamilton Harbour on Western Lake Ontario. Oct., 1986.

Ministry of Environment, West Central Region. Cootes Paradise Study, 1986. August, 1986.

Ministry of Environment, West Central Region. Confederation Park Microbiological Survey, 1979.

Ministry of Environment, Water Resources Branch. Lake Ontario Nearshore Water Quality Atlas 1976-1979. 1980.

Ministry of Natural Resources. Cambridge District Fisheries Management Plan: 1989-2000. Toronto: Queen's Printer, 1989.

Pollution Probe. Down the Pipe: A Review of Water Pollution Control in Ontario. Toronto: July, 1986.

"Study Says Great Lakes had 5,000 Spills in 1805", Toronto Star. April 20, 1990.

WATER

Regional Municipality of Hamilton-Wentworth. By-Law No. R89-049. 1989.

Vorhof, J.A. Groundwater Issues. Calgary: Environment Canada, Inquiry on Federal Water Poicy, Research Papers, Research Paper # 14, May 1985.

LAND

2.3 LAND

- 2.3.1 Jurisdiction
  - 2.3.1.1 Regional Official Plan and Area Municipalities
  - 2.3.1.2 Provincial Policy Statements and Programs
  - 2.3.1.3 Conservation Authourities

- 2.3.2 Aggregates
  - 2.3.2.1 Sand and Gravel
  - 2.3.2.2 Bedrock
  - 2.3.2.3 Official Plan Designation
  - 2.3.2.4 Environmental Impact and Rehabilitation

- 2.3.3 Agriculture
  - 2.3.3.1 Urbanization/Conversion
  - 2.3.3.2 Farm Practices: Soil Erosion and Pesticides
  - 2.3.3.3 Urban Use of Pesticides

- 2.3.4 Habitat: Flora and Fauna
  - 2.3.4.1 Environmentally Sensitive Areas
  - 2.3.4.2 Wetlands
  - 2.3.4.3 Woodlots and Forests

- 2.3.5 Solid Waste

- 2.3.6 Contaminated Properties

2.3 LAND

Understanding the state of the environment with regard to land is a challenging task. The discussion below merely touches the surface of some very complex interrelationships which together determine the quality of much of our environment. In some instances the quantitative measurements of land use changes or effects of specific activities on the land are not available for the Region, or are not as up to date or as precise as would be desired.

Given the quality of the information available this portion of the report includes a short review of the legal and political context surrounding the use of land, a survey of the land use issues facing the Region and, a discussion of trends in the last ten years or so. The legal and political discussion is by no means exhaustive and focuses primarily on the planning aspects of land use. Particular land uses are discussed in more detail in their respective sections.

Land is a fundamental natural resource. Many issues can be looked at from a specific viewpoint or scientific discipline but the appropriate use of land crosses the boundaries of many disciplines and remains a pervading theme of environmental concerns in general. Each ecosystem, from the smallest pond bottom to the continental scale, is nested in a larger ecosystem and each are open to influences from one another. Land is the critical element integrating the various ecosytems in space. Preserving species or rehabilitating the quality of our waterways inevitably comes down to the question of how a specific area of land is to be used. On the other hand, thinking in ecosystemic terms means we must be able to see not only the parts but how the parts fit together to make a greater whole.

Striking a balance between the need for settlement to accommodate population growth, for agricultural purposes, and preserving remnant natural areas is the challenging task of land use planning. Given our legal and societal principles of property, conflicting demands are inescapable. In Ontario, Queen's Park has issued a number of Provincial Policy Statements to introduce some measure of uniformity in decision-making rationale. Despite the intent of these Policy Statements no precise formula for weighing the trade-offs between the public interest and private rights is available that can be applied universally to all specific instances of land use conflict.

Resolving land use conflicts in the interest of social and environmental justice necessitates the participation of all parts of society in public decision-making. In the first instance no universally valid formula exists for determining public need. The system provides that individual cases of land use conflict which are reviewed by legal tribunal (Ontario Municipal Board) are treated equitably when it comes to procedure but since every piece of land is different the regulatory tribunal must deal with each case on its own merits.

LAND

In the broad sense of the word the decisions about what, if anything, should be done about controlling people's use of land are ultimately political. Many of the changes we make to the land resource to accomodate our present styles of living are irreversible and future generations are not here to join the debate about appropriate use. Sustainable development carries many different meanings for people but one fundamental idea is that any development that takes place must not reduce the ability of future generations to meet their own needs. Preserving the productive potential of the land means preserving the ecosystem structure with which it is associated, i.e landform, soils, vegetation and watercourses. Good environmental planning anticipates future needs not only of human populations but other animal species as well. If we preserve ecosystem structure we will also be preserving habitat for animals other than ourselves.

In response to various human activities the use of land changes constantly. Economic, demographic and attitudinal trends are all reflected in changing land use patterns as people choose where and how to live. Each person's private decision about changing the use of a given piece of land is based on the value or importance that person places on the subsequent use versus the existing use. However, the ecosystemic effects of such decisions may not be considered significant by the individual landowner while the incremental and cumulative effects on the ecosystem of such decisions may be substantial. For example, urbanization is known to have many varied impacts such as, the loss of food-producing soils, increased localized temperatures, increased surface runoff, increases in contaminants in runoff, loss of habitat, while a reduction in vegetation decreases photosynthetic production of oxygen.

Regionally, measurements of the marginal increases in such effects have not been compiled nor related to environmental issues. There is no reason to believe developments in the Region do not have such impacts. Meanwhile, the federal Department of the Environment has shown an interest in monitoring changes in land use. Statistics can give us a broad indication of the scale of the changes taking place. Between 1976 and 1980 an estimated 3,680 acres in the 'Hamilton Urban Centred Region' was converted from rural to urban type uses. (N.B. The federally defined 'Urban-Centred Region' includes parts of Halton Region and excludes Flamborough.)

LAND

Figures of this kind reflect the continued desire for suburban style living as well as the economic and demographic realities of Southern Ontario. Although the late 1970's was a slow growth period for the Region the number of households increased from 136,100 in 1976 to 155,600 in 1986. The Region's household growth has been more rapid than population growth. Future conversion of land in the rural-urban fringe areas may be expected since the population projections for 1988 to 2006 project an increase in households from 161,000 in 1988 to 193,500 in 2006, a 20% increase. Moreover, the suburban municipalities are expected to continue to grow most rapidly. From 1988 to 2006 population is projected to increase by 81% in Ancaster, 43% in Stoney Creek and 39% in Flamborough.

Characterizing land use change in a Region which includes both large rural and dense urban areas is not easy. That said, comparing 1982 acreages and 1987 acreages in specified land uses allows us to determine changes over the five year time period. The results of this comparison are presented in the accompanying Table "Land Area by Land Use", Table 2. The available records are imprecise and caution must be exercised in drawing conclusions based on the data. In order to determine longer term trends and more precise figures a finer analysis than the assessment data allows would be required.

The Table, "Land Area by Land Use", shows that the predominant use of land in the Region is agricultural. Over 50% of the land in the Region is farmed. Residential and forested lands form the next largest elements of use. The general direction of the changes in land use reported in the Table is what would be expected from suburban growth; an increase in residential acreage and a decline in farmed area.

The average rate of conversion of rural to urban land use in Canada through 1981-1986 for Urban Centred Regions of a population class 250,001 to 500,000 was **193 acres per 1,000 population increase.** Based on the assessment data in "Land Use Characteristics" presented in the Table, and estimates of population change between 1982 and 1987, the estimated conversion rate for the Region of Hamilton-Wentworth between 1982 and 1987 was **360 acres per 1,000 increase in population.**

The higher than average rate in our Region likely reflects the fact that smaller municipalities convert more land per 1,000 population increase than larger cities and the Region's largest percentage population increase has occurred in Ancaster, Flamborough and Stoney Creek.

LAND AREA BY LAND USE
REGION OF HAMILTON-WENTWORTH (1982 / 1987)

CATEGORY	1982 Acres	1982%	1987 Acres	1987%	Absolute Increase/ Decrease	Increase/ decrease % of 1982
Farmed	145,541	52.92	144,034	52.37	-1,507	-1.04
Forests	35,885	13.05	34,144	12.42	-1,741	-4.85
Low and Medium Density Residential	32,667	11.88	36,926	13.43	4,259	13.04
Other Undeveloped	11,298	4.11	11,697	4.25	399	3.53
Public Open Space	10,734	3.90	10,367	3.77	-367	-3.42
Transportation and Communication	7,226	2.63	7,397	2.69	171	2.37
Industrial	5,414	1.97	5,394	1.96	-20	-0.37
Institutional and Office	3,952	1.44	4,389	1.60	437	11.06
Private Open Space	3,426	1.25	3,091	1.12	-335	-9.78
Retail	3,104	1.13	3,257	1.18	153	4.93
Undeveloped (Cliffs, Ravines, Swamps)	1,259	0.46	1,334	0.49	75	5.96
Aggregate/Mines	1,254	0.46	1,083	0.39	-171	-13.64
High Density Residential	1,209	0.44	1,253	0.46	44	3.64
Large Open/Public Utility Space	702	0.26	702	0.26	0	0.00
Uncategorized Acreage	11,351	4.13	9,954	3.62	-1,397	-12.31
Absolute Total	275,022	100.00	275,022	100.00	0.00	

Source: Land-Use Characteristics, Hamilton-Wentworth Planning and Development Department & Assessment Records

Table 2

LAND

Changes in the reported acreage which may be cause for concern are the decreases in the area of open space and forested lands. Determining the precise nature of the causes for these decreases and whether they are likely to continue, (where, how) is beyond the scope of this State of the Environment Report. Further study is necessary to pinpoint the reasons for, and severity of, the decreases. Co-ordination between existing environmental groups, Area Municipalities, the Region and other agencies involved is necessary if we are to get an accurate picture of what is going on.

For example, records of the Canada Land Inventory classification of lands approved for division by the Land Division Committee were kept only until the early 1980's while no similar statistics were kept for subdivision approvals. Baseline information gathered for specific indicators needs to be systematized so that subsequent studies all can measure or use the same parameters for analysis. Moreover, even public projects of the Region are presently not documented in a manner to allow for the analysis of long-term effects on land-use change. For instance, the extent to which water mains have been extended beyond the designated urban boundary is not readily available information. Five year and ten year infrastructure development are not available.

Although the Official Plan supports the protection of Woodlots no specific objectives or targets were set. Environmental issues addressed by the Regional Official Plan have in most cases not been monitored as to the effective implementation of such policy. An Official Plan Review was initiated in 1990 and will run for two years. The timing of the Review and the Sustainable Development Task Force coincide since the Task Force has been given the mandate to provide guidance for the Review. The Review process will determine the need for changes in policy with plenty of opportunity for public input.

Entities like the Chairman's Advisory Committee on Environmental Issues are exploring the best manner to play an expanded role in evaluating the environmental issues involved in land use. Although redundancy or proliferation in organizational structure is an everpresent danger since environmental issues by their very nature often overlap and intersect jurisdictional and departmental boundaries, presently the information needed for the evaluation of the adequacy of environmental policy is scattered amongst different groups. In the meantime any evaluation of the success or failure of local implementation of Regional environmental policies would be difficult and time-consuming due to the lack of information collected for that purpose.

In the absence of such basic information it is worth noting that considerable positive success has been recorded by initiatives taken outside the municipal policy framework. To date the Natural Heritage Stewardship Program has made personal contact with 180 private landowners in the Dundas Valley and Beverly Swamp areas of the Region. The Program has arranged over 100 voluntary Private Stewardship Agreements covering 1,540 acres of land.

2.3.1 Jurisdiction

2.3.1.1 Regional Official Plan and Area Municipalities

Land use falls within the jurisdiction of the Region but responsibility is shared with the Province and Area Municipalities. Land use within the Region is guided by the Regional Official Plan which must be adopted by Regional Council. The Planning Act defines an Official Plan as a document approved by the Minister (of Municipal Affairs), containing objectives and policies established primarily to provide guidance for the physical development of a municipality, while having regard to relevant social, economic and environmental matters. The Hamilton-Wentworth Planning Area contains the municipalities of; Ancaster, Dundas, Flamborough, Glanbrook, Hamilton and Stoney Creek.

The Plan deals with matters of Regional concern and with those matters which are direct Regional responsibilities. In general the areas of Regional interest are:

1. Population size of communities
2. Supply and general location of future housing incorporating protection of agricultural land
3. General location of future industrial complexes
4. Supply of water and the provision of sanitary sewage and waste disposal services
5. Provision and co-ordination of social and public health services
6. Regional roads and public transit and
7. Management of various natural resources.

The Regional Plan is primarily a policy document and it is expected that detailed land-use designations will be implemented by the Area Municipal Plans and subsequently in the local zoning by-laws. The Area Municipal Plan and zoning by-laws must conform to the Regional Plan. The zoning by-laws passed by each Area Municipality are the primary means of land-use control. Official Plans control the activities in the municipality in general while zoning by-laws act to control the activities of land-owners.

2.3.1.2 Provincial Policy Statements and Programs

Since, in law, municipalities are created by the Province, the Province determines the groundrules or legal structure in which municipalities operate. Provincial policies and programs must be taken into account in the preparation of Municipal Plans. Without describing in detail these policies, those with environmental implications are outlined below.

Niagara Escarpment Plan

Approved in 1985 the Niagara Escarpment Plan seeks to conserve significant natural areas and culturally important sites while providing direction for planning within the area covered by the Niagara Escarpment Development Act. The Plan is currently under review. The Niagara Escarpment Commission administers a development permit system, comments on, and monitors activities within the Escarpment Plan Area. Any development that occurs within the area of the Niagara Escarpment Plan is subject to a development permit from the Commission. There are six categories in the land use plan. In Hamilton-Wentworth the Plan Area covers the cliff face and large areas of land within the Dundas Valley.

In February 1990 the Niagara Escarpment was named a Biosphere Reserve by the Unesco, Man and the Biosphere Programme.

Table 3 **NIAGARA ESCARPMENT PLAN**

AREA		**ACRES DESIGNATED**				
MUNICIPALITY	NATURAL	PROTECTED	RURAL	URBAN	REC'TION	MINERAL
Ancaster	2451	2770	932	1037		100
Dundas	419	637		611		
Hamilton	1062	920		2019		
Stoney Creek	821	2303	247	1159		49
Flamborough	1519	2309	5032	574		38
Total	6273	8942	6212	5401		187

LAND

Parkway Belt System

The Parkway Belt West Plan incorporates areas along the lip of the Escarpment near Waterdown and portions of the Dundas Valley surrounding Cootes Paradise. Essentially these are lands which are part of the 403 transportation corridor, utility rights of way, and areas controlled by the Royal Botanical Gardens. Passed by Cabinet in 1978 the objectives of the System are to separate and define the boundaries of urban areas, provide a land reserve for future transportation or utilities corridors and provide a system of linked open space and recreational facilities. The Parkway Plan is considered part of the Regional Official Plan. For consistency purposes the Provincial Government has made a committment that the portions of the Escarpment covered by the Parkway Belt Plan are to be incorporated into the Niagara Escarpment Plan.

Foodland Guidelines

The Foodland Guidelines represents a Policy Statement of the Provincial Government and requires that agricultural soils of high food producing capabilities, and particularily specialty crop lands be identified and protected for future food production. (High capability as defined by the Canada Land Inventory classification system. I.e. classes 1,2,3 and 4) In reality the Guidelines only establish the rationale or justification necessary before such lands can be converted to urban uses. Thus the Guidelines provide no absolute protection. The Guidelines are used when development proposals are being considered in agricultural areas. The Guidelines have been under review by the Province for a number of years.

Mineral Resources

Mineral aggregate is the structural element of soil, i.e. sand, gravel and stone. It is a non-renewable resource but at present cannot be described as scarce. It is the main component in concrete, mortar and asphalt. Almost all the gravel in Ontario is mined close to markets in the urbanized south.

Previously, the Province regulated aggregate extraction (gravel, stone and sand) through the Pits and Quarries Control Act. The Act set out the provisions for licensing as well as the requirements for rehabilitation of pits. For each tonne extracted from a pit the operator contributes six or eight cents to a rehabilitation bond which it forfeits if it does not complete rehabilitation work. The new Aggregate Resources Act proclaimed January 1 1990, strengthens Ontario's ability to control potential negative effects of extraction.

LAND

The detrimental environmental effects of aggregate extraction include noise, dust, changes to local hydrology regimes when mining occurs below the water table, silty run-off, loss of agricultural land and those effects associated with heavy truck traffic. Fines for violating the Act have been increased and the role of municipalities in licensing and reviewing operations of pits and quarries has increased. Progressive rehabilitation of all pits is the intent of the legislation.

The Province has also issued a Mineral Aggregate Resource Planning Policy Statement (MARPS) with which all local and Regional Plans must comply. The Policy states that any Plan must identify aggregate resources areas and ensure that incompatible land uses are minimized in these areas so as to protect the future, potential, extraction of aggregate. Policies in municipal plans are also expected to encourage rehabilitation.

Wetlands (Draft)

The Ministry of Natural Resources has circulated for comment a draft Wetlands Policy Statement. If passed the Policy would require municipalities to identify and protect provincially significant wetlands in their official plans. Provincially significant wetlands would be placed in a restricted zoning category which permitted only wetlands and compatible land uses. Presently the Ministry has published the Wetland Guidelines which addresses the issue of protecting wetlands but does not regulate municipal planning for land use in such areas. The strength of protective policies for wetlands is in the hands of the Region and area municipalities. Presently, all the provincially significant wetlands in Hamilton-Wentworth are designated Environmentally Sensitive Areas (ESAs) in the Official Plan. ESA designation does not absolutely prohibit development.

2.3.1.3 Conservation Authorities

Conservation Authorities have a broad mandate under Section 20 of the Conservation Authorities Act. They are funded jointly by the Province and municipal governments. The Region of Hamilton-Wentworth is divided into four separate watersheds which are under the jurisdictions of the Halton Region, Hamilton Region, Grand River, and Niagara Peninsula Conservation Authorities.

Within its jurisdiction each Authority is responsible for the establishment and implementation of programs designed to further the conservation, restoration, development and management of natural resources. The Conservation Authority's main mandate is to manage local water and related land resources in accordance with the Conservation Authorities Act, however, in response to both local and provincial needs, the Authorities have become involved in numerous ancillary activities leading to a number of important resource management benefits. These include, fish and wildlife, outdoor recreation, tree plantings, conservation education, heritage conservation, waterfront development, wetlands protection, and Environmentally Sensitive Area protection. The Conservation Authorities are responsible for acquiring the land under the Niagara Escarpment Plan. For example, the Hamilton-Wentworth Conservation Authority has 13 conservation areas totalling approximately 4,900 acres that support many recreational activities. The public recreational utility of such green spaces is reflected in the estimated 63,000 user days per year associated with the the Royal Botanical Gardens, a 2,000 acre park around Cootes Paradise.

The Conservation Authorities are a key institutional actor in the land use planning process since they exercise considerable authourity over the condition of water resources, control of drainage, storm sewer routes, and flood mitigation measures. Most developments of any size will have some impact on nearby water flows. The Conservation Authority's views on the necessity for mitigating measures in specific developments are often made conditions of development approval. Thus, the Authourities must be satisfied that the landowner's development plans will not adversely affect drainage patterns or endanger local stream quality.

2.3.2 Aggregates

There are presently 10 companies granted operating licences by the Ministry of Natural Resources for sand, gravel and limestone extraction in the Region. These operations are currently licensed to extract about four and a half million tonnes. (4,579,192 tonnes).

2.3.2.1 Sand and Gravel

The identified sand and gravel resources of primary significance in the Region cover an area of 3,400 acres with an estimated resource of 188 million tonnes. These totals represent almost all of the sand and gravel resources in the Region and are concentrated in the Township of Flamborough. Other areas that have sand and gravel resources have limited potential because the existing land uses make them inaccessible. Annual production levels fluctuate and are strongly related to construction industry trends. Average annual production has been about 400,000 tonnes.

2.3.2.2 Bedrock

Regionally the total possible crushed stone resources are approximately 13,400 million tonnes and constitute a resource of provincial significance. While many parts of the Region contain such resources (30% of the land area) much of the area is unavailable to extractive activity because of incompatible uses, the Niagara Escarpment Plan and physical features such as the Beverly Swamp and other environmentally sensitive areas.

In total present pits and quarries licences in the Region cover 2,178 acres with Flamborough accounting for 1,458 of these acres.

2.3.2.3 Official Plan Designation

The Official Plan includes provisions to protect for future use those areas in the Region which have been identified as significant resource areas. (See map, Figure 22) These areas are identified as Policy areas 'A' and 'B'. More detailed and up-to-date maps are contained in the Area Municipal Official Plans. Policy Area A covers sand and gravel deposits while Area B covers stone aggregate. The Plan includes a policy stating that each extraction operation within the Region will be monitored for its effect on;

1) the environment,
2) transportation and road facilities and,
3) rehabilitation activities.

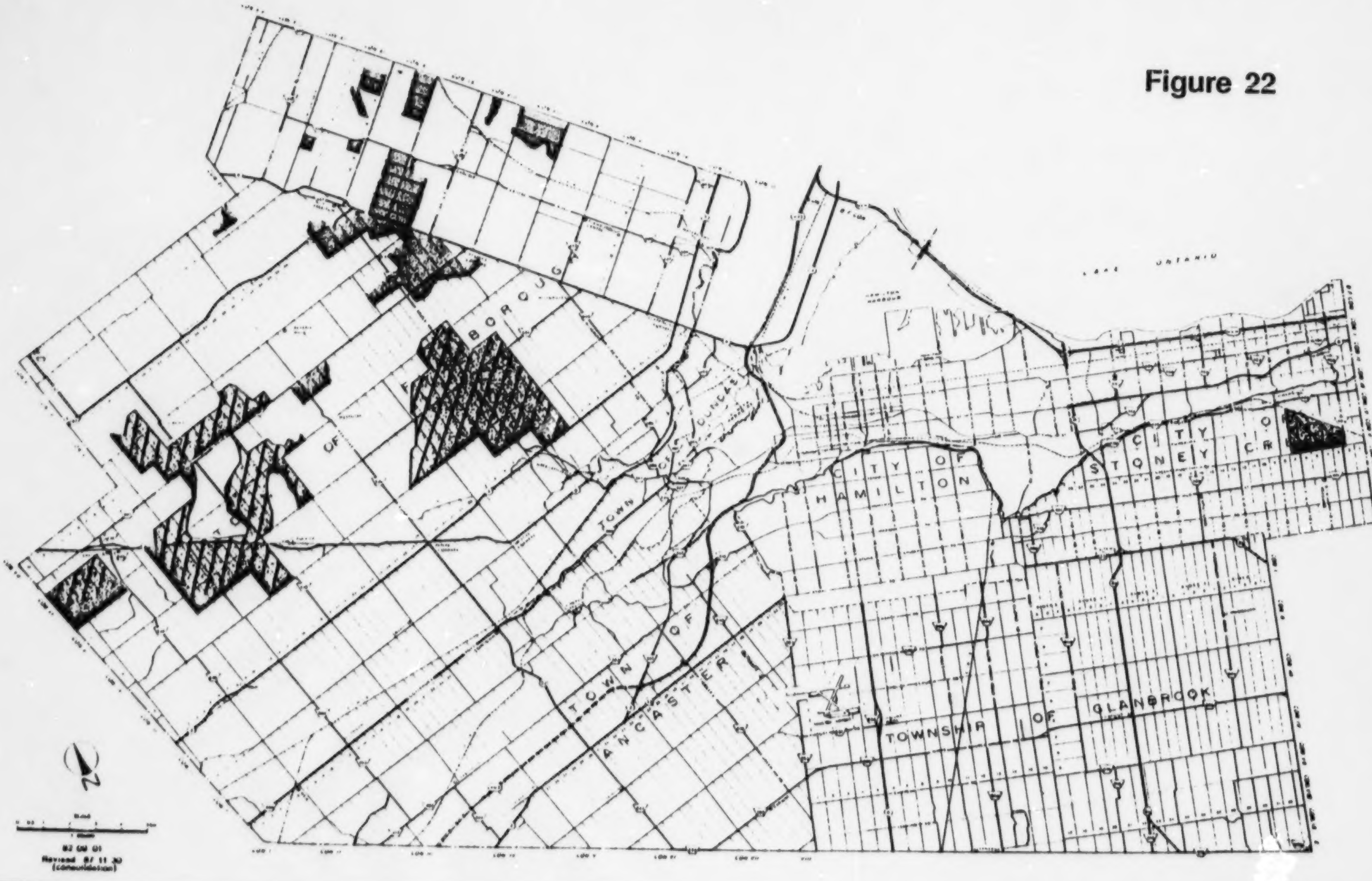
The Region has not been doing this monitoring. The MOE monitors dust from the Steetley site.

A comparison of the locations of the Environmentally Sensitive Areas and Aggregate Policy Areas (See maps, Figures 22 and 23) shows that nine ESA's (#'s 1, 3, 4, 5, 6, 9, 8, 36, and 37) border on protected extraction areas. A monitoring program seems to be in order. Where extraction has not yet begun it is necessary to have baseline information in order to assess the impact of future extraction.

2.3.2.4 Environmental Impact/Rehabilitation

Trucks/Noise and Dust: The MOE measures airborne dust near Steetley Industries, a limestone quarry in Flamborough. The most recent statistics available showed that improvements in dustfall levels continued in 1988 from 1987 following the installation of a new electrostatic precipatator at the company's processing plant. Further measures are being taken by the company as some dustfall levels are still above objectives. The success of rehabilitation is difficult to judge. (See for example Steetley Proposals under Waste Management)

Figure 22



LEGEND

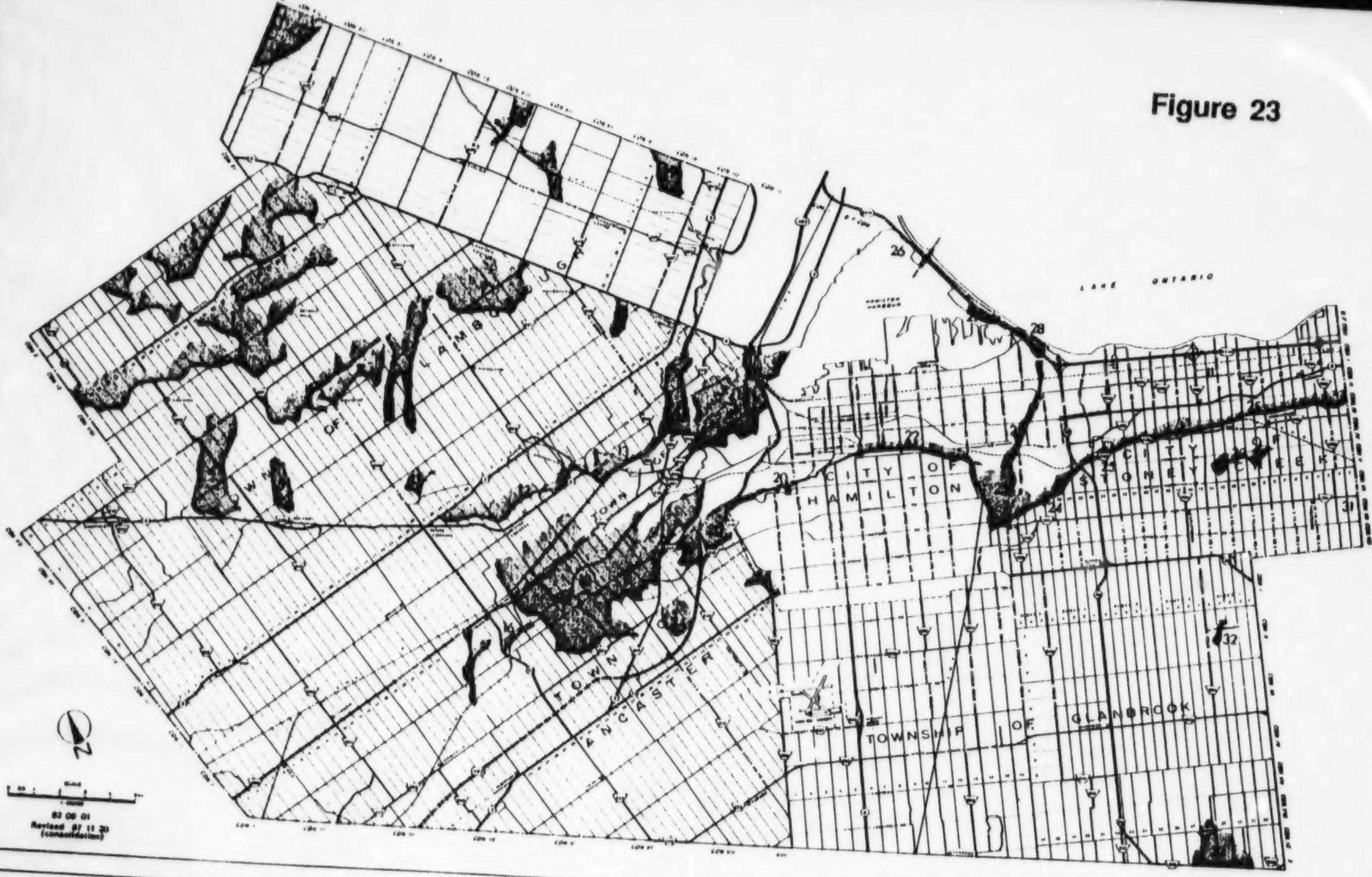
POLICY AREA 'A' (Gravel and Sand) ▨

POLICY AREA 'B' (Stone Aggregates) ▨

MINERAL RESOURCE AREAS

Planning & Development Department
Hamilton - Wentworth Region

Figure 23



LEGEND

ENVIRONMENTALLY SENSITIVE AREAS ▨

1 Beverly Swamp
2 Valens
3 Fletcher Creek Swamp Forest (Crieff Bogg)
4 Hyde Tract, Rockton Tract and Beverly Sparrow Field
5 Rockton Wetland
6 Westover Wetland
7 Westover Drumlin Field
8 Forestry and Wildlife Area
9 Haysland Forestry and Wildlife Area
10 Millgrove Woodlot
11 Donald Farm Wetland
12 Christie Conservation Area
13 Spenser Gorge (Webster's and Tew's Falls)
14 Borer's Falls - Rock Chapel
15 Royal Botanical Gardens - Cootes Paradise
16 Summit Muskeg Preserve
17 Copetown Woods
18 Dundas Valley
19 Tiffany Falls
20 Hamilton Mountain (Radial Line)
21 Ancaster Creek Headwater
22 Hamilton Niagara Escarpment
23 Red Hill Creek - King's Forest
24 Felker's Falls and Niagara Escarpment
25 Niagara Escarpment - Devil's Punch Bowl East
26 Hydro Islands
27 Toll Gate Ponds
28 Red Hill Creek Marsh - Van Wagner's Marsh
29 Lake Medad
30 Saltfleet Woodlot
31 Tweedside Forest
32 Woodburn Floodplain
33 Sinclairville Lowland Forest
34 Hamilton Golf and Country Club
35 Mountsberg
36 Bronte Creek Ravine
37 Carlisle Swamp

ENVIRONMENTALLY SENSITIVE AREAS

Planning & Development Department
Hamilton - Wentworth Region

2.3.3 Agriculture

Soil capability and climate are the two most important limitations to agricultural production. All land in Canada is classified into seven groups by the Canada Land Inventory (CLI). These classifications are based on climate and soil capability.

Class 1 - no significant limitations for crops
Class 2 - moderate limitations restricting the range of crops
Class 3 - moderately severe limitations
Class 4 - severe limitations
Class 5 - very severe limitations, improved pasture capability
Class 6 - only useful for perennial forage crops
Class 7 - no capability for arable culture

Class 1 land is twice as productive as Class 4 land with the same energy input. According to the CLI, Classes 1-3 are prime agricultural land while the Ontario Foodland Guidelines includes Class 4 as high capability land worthy of protection. Only 5 % of Canada's land is in Classes 1-3 and only .5 % is Class 1. Half of this Class 1 land is in Southern Ontario. Generally, the agricultural land in Hamilton-Wentworth is in Classes 1-3.

The United Nations World Conservation Strategy released in 1980 has identified as its first priority the preservation of prime quality croplands. Erosion, salinization, desertification and urbanization threaten the food producing resource world-wide. With a rapidly expanding global population and a shrinking, finite food-producing resource the rationale for protecting good farmland is clear.

Ontario is not immune from the realities of world food trade. Ontario remains a net importer of food; $ 1.4 billion in 1987 and $ 1.3 billion in 1986. Two thirds of the food imported consists of commodities grown commercially in Canada. In the drought year of 1988 the U.S. became a net importer of grain for the first time in its history. The security of our food supply continues to be a question for debate.

Uncertainty over the predicted "Greenhouse Effect" compounds uncertainties regarding the stronger role played by international agricultural subsidization policies and trade liberalization. In many cases, because of these uncertainties and the acceleration of land values due to urban pressures in some locations, farming has become economically unattractive in Canada. Commodity prices at the farm gate have not kept pace with the increased cost of farm inputs. The net result of all these factors has encouraged the reductions in farm numbers (not farm size), farm population and the area of land under cultivation. (See Table 4, "Agriculture and Land Use, Selected Stats")

Agriculture and Land Use
Selected Comparative Statistics 1981/1986

Number of Census Farms	**1981**	**1986**	**Percent Change 1986/1981**
Canada	318,361	293,089	-7.94
Ontario	82,448	72,713	-11.81
Hamilton-Wentworth	1,553	1,393	-10.30
Area of Census Farms			
Canada ('000 acres)	167,986	167,601	-0.23
Ontario ('000 acres)	14,923	13,953	-6.50
Hamilton-Wentworth (acres)	158,519	145,083	-8.48
Rural and Farm Population			
Total Population (Region)	411,445	423,400	2.91
Total Rural Population	36,110	37,500	3.85
Rural Farm Population	4,940	4,235	-14.27

Source: Agricultural Statistics For Ontario, Ontario Ministry of Agriculture and Food, 1988.

Table 4

Nevertheless, agriculture constitutes the largest land use in the Region. In 1987 144,000 acres were farmed. The economic spin-offs of the sector are substantial. The percentage of the workforce employed locally has been calculated as 8 % in the agribusiness sector with 12 % associated indirectly with the food sector. Hamilton-Wentworth farmers spent $ 94 million annually on wages, feed, seed, fertilizer, energy, interest, and other farm inputs while capital investment approaches $500 million. Fruits, vegetables, nursery and floriculture accounted for over 40% of farm cash receipts in the Region in 1987.

Environmentally, current issues related to agricultural land use can be broadly separated into two categories; 1) **urbanization** of rural land and 2) **farm practices** leading to soil degradation or persistence of pesticides in the ecosystem.

These categories of issues are not wholly independent of one another. The agriculture community and economy is being affected by the purchase of farms by traditionally non-farming interests, i.e. speculators, hobbyists, estate residential developers etc... In some cases, good agricultural land is left unseeded and becomes less agriculturally viable as brush and scrub plants take hold, while in others the land is rented to large farm operators. Rented land may be subject to short term farm practices that do not benefit soil health because the operator has no interest in improving the land. If farming is perceived to be a temporary use of the land until some more economically attractive opportunity presents itself the incentive to "mine the soil" of its nutrients and reduce more costly conservation techniques is high.

Further, as the number of farms is reduced in favor of larger operations the market of farm implement dealers and insurance brokers etc... that service the agricultural community is reduced. As businesses change their focus farmers must go further afield for service. In highly populated Southern Ontario economic dynamics driven by urban social forces lead to constant change in the nature of the rural community. The affects on the farming community as a separate group within the rural community is difficult to document, let alone the environmental repercussions that are caused by such changes. We do know that farmers are becoming a smaller constituent element of the rural population.

2.3.3.1 Urbanization/Conversion

In the 25 years between 1966 and 1981 a quarter of a million hectares of rural land across Canada was converted to urban use. 57% of this was prime agricultural land. Purportedly, up to one third of Canada's Class 1 land can be seen from the top of Toronto's CN tower while across the country over half of the Class 1-3 agricultural land lies within a 160 km radius of Census Metropolitan Areas. As Canadian cities grow in size they grow out onto top quality agricultural land. Overall figures available indicate that urbanization of high quality farmland continues to be a problem nation-wide.

LAND

The Regional Official Plan incorporates a number of policies in its Official Plan regarding the protection of 'prime' agricultural land, i.e. Classes 1-4. These policies range from specific rules regarding the granting of land severances (creating two or three properties from one land holding) in rural areas to general policies requiring the encouragement of settlement in identified rural settlement areas.

Over the last ten years about 77 percent of severance applications have received final approval. (See Table 5, Land Division Committee Decisions) The success of these policies in preserving agricultural land is hard to gauge but we can determine that the number of applications received per year has climbed steadily since 1983. There is no requirement that a landowner build on, or sell a new lot within a given period of time. Therefore, many lots of record exist in agricultural areas that are not apparent because homes, driveways or fences do not delineate the properties in the landscape.

Estimated conversion rates are relatively high in the Region but subdivision approvals not severances are likely the predominating form of land use change in the urban-rural fringe. Land which is being used for typically rural purposes may actually be designated as part of the urban area. In 1980, for example there were 1,950 acres of land within Hamilton city limits in agricultural production although this land had been designated for eventual residential or industrial development. Increases in non-farm population in rural areas early in the decade (see above) add to the perceptions of high ex-urban migration in the area. If this trend continues development applications for homes in rural subdivisions or rural estates will probably continue to put conversion pressure on presently rural land.
One aspect of the Foodland Guidelines worth discussing is the provision for 'justification of need' prior to approval for a specific development on farmland. As of January 1990, there were 4,800 acres of vacant residential land within designated urban areas in the Region. This land had an estimated development potential of 46,860 dwelling units. Given that present development trends continue, Hamilton, Dundas and Flamborough probably have a 10 to 15 year supply of this designated residential land while Stoney Creek, Ancaster and Glanbrook have a twenty year supply. On the face of it there appears to be enough land presently designated residential to accommodate the needs of the community at large.

REGIONAL LAND DIVISION COMMITTEE DECISIONS

APPLIED	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	TOTAL
ANCASTER	29	52	49	54	42	46	62	85	58	70	547
DUNDAS	22	26	17	14	17	17	22	29	24	31	219
FLAMBOROUGH	111	82	82	55	82	82	113	111	140	164	1,022
HAMILTON	129	123	17	32	36	29	41	44	75	86	612
GLANBROOK	30	39	105	101	162	159	161	156	191	259	1,363
STONEY CREEK	65	66	62	77	51	100	109	133	73	87	823
TOTAL	386	388	332	333	390	433	508	558	561	697	4,586

APPROVED	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	TOTAL
ANCASTER	18	41	36	38	30	38	46	71	42	49	409
DUNDAS	20	22	16	13	17	14	17	29	21	29	198
FLAMBOROUGH	41	43	49	28	48	60	75	76	87	81	588
HAMILTON	116	101	8	18	24	17	28	30	43	35	420
GLANBROOK	6	22	102	92	144	153	139	144	181	249	1,232
STONEY CREEK	46	49	52	67	44	86	91	107	63	74	679
TOTAL	247	278	263	256	307	368	396	457	437	517	3,526

DENIED	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	TOTAL
ANCASTER	9	5	7	8	9	3	7	10	7	13	78
DUNDAS	1	3	1	1		1	1	0	1	1	10
FLAMBOROUGH	57	27	27	26	26	16	28	27	43	75	352
HAMILTON	3	1	8	12	11	11	10	11	27	41	135
GLANBROOK	24	16	1	2	2	2	3	0	2	4	56
STONEY CREEK	6	9	4	7	4	3	4	10	5	11	63
TOTAL	100	61	48	56	52	36	53	58	85	145	694

SOURCE: LAND DIVISION COMMITTEE ANNUAL REPORTS

Table 5

2.3.3.2 Farm Practices: Soil Erosion and Pesticides

Existing farming practices in Canada are dependent on the application of pesticides (herbicides and insecticides) and chemical fertilizers. Increasing size and specialisation of farms has reduced the diversity of crops grown on specific farms (monocultures) and increased the use of larger and heavier farm machinery. This modern approach has been succesful in increasing crop yields but mainly in response to increasing inputs of energy. Presently, Canadian farmers use nine units of petrochemical energy to produce one unit of food energy and use up to 80,000 tonnes of pesticides a year. Negative consequences of heretofore accepted farm practices are now being discovered to include soil compaction and erosion, salinization and runoff of pesticide residues.

Soil deterioration costs have been borne by farmers as they increased fertilizer inputs to maintain high levels of productivity. Total costs are hard to measure but lost production has been estimated at $ 1.3 billion annually for Canada. Costs were estimated at $ 91 million dollars annually in Southern Ontario. These costs of soil deterioration do not include off farm effects; sedimentation of water bodies and pollution by pesticides and fertilizers. An American study has indicated that off farm costs due to soil erosion are probably higher than on farm costs.

The people who work most with pesticides, which range in their toxicity to humans, may be most likely to experience health problems. A study of 70,000 Saskatchewan farmers released in 1989 suggests that those farmers who sprayed the most 2,4-D and other herbicides died of lymphatic cancers more often than those who used fewer herbicides. Some have questioned the credibility of the study results. On the other hand, health effects on farm labour have been documented in the U.S. by the United Farm Workers. Although pesticides form a group of chemicals on which much study has been done there remains a significant difference of opinion on the implications for health risk related to their use.

Water run-off and surface erosion from farm fields can carry pesticides and fertilizers into local watercourses where they can have significant water quality effects. Estimates of the quantity of active ingredients in pesticides sprayed on Hamilton-Wentworth field crops within the past decade suggest substantial decreases in the use of these chemicals by farmers. These large decreases are not applicable to the use of pesticides on fruits and vegetables. (See Table 6) The reductions in the quantities of active ingredient applied are larger than would be indicated from the reductions in farmed area. That is, the reduction in the use of pesticides cannot be solely attributed to reductions in the acreage of farmed land and therefore farmers are changing their practices.

LAND

In 1988, Hamilton-Wentworth farmers were relatively low users of pesticides per hectare compared to other Counties in Southern Ontario. In only one category did Hamilton-Wentworth approach the highest rate of application.

Table 6

ESTIMATED AGRICULTURAL HERBICIDE AND INSECTICIDE USE 1983/1988 (kilograms) Hamilton-Wentworth

	HERBICIDES					
Crop	**Triazine**	**Phenoxy**	**Other**	**Insect.**	**Fungi**	**Total**
Field						
1983	25350	8070	26460	6670	0	66550
1988	11020	7530	9160	680	0	28390
Fruit						
1983	130	10	270	7930	23520	31860
1988	380	20	670	7060	21420	29550
Vegetables						
1983	730	310	2420	4850	4980	13290
1988	460	40	2690	2950	5220	11360
Roads						
1983		880	110			990
1988		na	na			na
Total						
1983	26210	9270	29260	19450	28500	112690
1988	11860	7590	12520	10690	26640	69300

Source: Remedial Action Plan for Hamilton Harbour: Goals, Problems and Options Discussion Document, March 1988 and Ontario Ministry of Agriculture and Food, Survey of Pesticide Use in Ontario, 1988, 1989.

A 1985 International Joint Committee Report assessing the human health effects of Great Lakes water quality identified two pesticide chemicals that are of concern for human health because of levels discovered in fish or water. These are; alachlor (now banned in Canada), and oxychlordane. There are 16 pesticides on the U.S. Environmental Protection Agency's list of priority pollutants.

LAND

Pollutants initially applied as pesticides are usually attached to soil particles, especially organic particles, and are thus relatively immobile. However, erosion whether by wind or water transports sediment particles. In the aquatic ecosystem these transported particles or their attached persistent chemicals can become available to the aquatic food chain.

> "The contribution of contaminants from rural land run-off to the total contaminant burden of the Great Lakes has not been unequivocably established, but available data indicate the loadings may be sizeable." (Great Lakes Water Quality Board 1987, p. 23)

Hence, erosion control will reduce pesticide run-off as well as preserve the significant soil resource. The effects on ground water quality due to pesticide application in the Region is a relatively underexplored area of study. (See Water Quality)

Remedial measures are varied including those which reduce dependence on pesticides and those which reduce erosion through improved soil health. The following incomplete list gives an idea of the approaches local farmers could and are taking:

- tillage reduction, "low-till" agriculture, e.g. leaving corn stubble to over-winter, ridge tilling to contain water
- increasing the diversity of livestock on individual farms
- planting more fall cover crops
- improved manure storage and manure spreading practices
- better capture and treatment of milk house wastes
- rotation of crops to break pest lifecycles
- green manures, including nitrogen fixating crops in the rotation
- planting of windbreaks and hedgerows
- grassed waterways in fields
- planted buffers along waterways to prevent destabilization of streambanks
- decreased free access of cattle to streams
- various integrated ecological farming systems, 'bio-dynamic'or 'organic' are supported by product labelling and certification programs.

In the U.S. access to commodity subsidization programs has been linked to the application of some of the practices above. Canadian Provincial and Federal policy has not been so obviously based on financial incentive. In Ontario, if farmers follow the voluntary Agricultural Code of Practice they are immune from private prosecution under the Environmental Protection Act (Right to Farm Legislation).

Education programs are on-going features of the provincial Ministry of Agricultural and Food. Some of our local Conservation Authorities participate in the "Rural Beaches Project" which seeks to protect water quality through the improvement of on farm practices. Provincially initiatives to deal with environmental concerns related to farm practices are varied and include the following;

1. Food Systems 2000: a program to reduce pesticides in food production through research and extension of new methods of pest control. The target is a 50% reduction over the next 15 years.

2. Pesticide Safety Courses: A program to educate farmers on the safe handling, application, storage and disposal of containers. Certificates have been issued to 350 Hamilton-Wentworth clients who successfully completed the course. Courses will continue in 1990/1991.

3. Ontario Soil Conservation and Environmental Protection Assistance Program: Provides $ 5.5 million a year for capital grants for soil conservation projects, manure storages, milk-house & parlor washwater disposal and pesticide handling facilities. This program began in 1986 and ends in 1990. All budgeted money for this program has been committed. 94 Wentworth farmers are applicants.

4. Land Stewardship Program: a three year program ending in 1990 providing $ 40 million for first time adoption of conservation practices. The budgeted money has all been committed. 84 Region farmers are applicants.

2.3.3.3 Urban Use of Pesticides

The use of pesticides is not solely an agricultural issue. Homeowners, city and institutional maintenance departments use pesticides in significant amounts. In many cases our local municipal works Departments are decreasing their use of pesticides, mainly 2,4-D, a broad-leaf herbicide. Expert panels have determined that there is insufficient evidence to declare 2,4-D a human carcinogen, nor can it be exonerated. The risks to humans of the chemical are still hotly debated but the visibility of the extent of the chemical's use has increased with requirements of posting on sprayed areas.

LAND

It was estimated that in 1986, some 43% of Ontario homeowners used up to 100,000 kilograms of the total 532,000 kilos of 2,4-D sold. Approximately 443,820 containers of domestic use herbicides, 567,853 packages of impregnated fertilizers, and 40,000 weed bars were sold in the Ontario home and garden market. Meanwhile, commercial applicators purchased 108,000 kilograms of active ingredient 2,4-D. The proportion of this applied by commercial lawn care companies is impossible to determine.

A survey of the six major franchised lawn care companies in Ontario indicates that in total 23,937 Ontario hectares were treated with 2,4-D in 1986.

Target	Hectares
Schools	172
Parks	188
Cemetaries	39
Roadsides	4
Residential Lawns	23,504
Other	37

These figures show the significant size of the chemical lawn care market.

2.3.4 Habitat: Flora and Fauna

This chapter of the State Of Environment concentrates on natural areas in the Region. This type of language is nevertheless misleading. Nature is not constrained to these places, every eavestrough or vacant lot has wild plant and animal species that make their homes or forage for food in its space. The natural areas which attract the most attention are simply large enough places to warrant interest at the Regional scale and which generally have recognizable, relatively undisturbed vegetative communities and an associated animal community. As such, they are often the 'remnant' or left-over places that did not experience, or have since recovered from the broad-scale landscape changes that followed European settlement. In the future it is hoped that we will pay increasing attention to naturalizing derelict or under-used urban areas.

Hamilton-Wentworth lacks any truly comprehensive inventory of flora and fauna found in the Region. To date the most comprehensive study in existence for the Region is a study completed in 1976 by Ecologistics Limited that was commissioned by the four conservation authorities located within the boundaries of Hamilton-Wentworth. The objective of the study was the classification of the Region's remaining natural areas and landmarks according to some criteria of relative importance that would allow the most "important" areas or sites to be protected under the then new Regional Official Plan. Criteria used in this ranking process included the number and diversity of fish, animal and bird species found in these locations as well as the recreational capacity and the unique physical or geological attributes of the sites in question.

Although not totally comprehensive because of the emphasis on a number of predetermined locations, the Ecologistics study is probably the best overall collection of biological information of the Region ever undertaken. Unfortunately, since the mid-1970s only site-specific studies have been completed. Breeding-bird counts, reptile and amphibian inventories and the like have yet to be consolidated into a comprehensive document.

A recent Hamilton Naturalist Club report examining the extent of biological knowledge about the Region's existing natural areas concluded that very little is known about the biological attributes of a large number of the environmentally sensitive areas within Hamilton-Wentworth. The Region's ESAs can be divided into three categories according to the amount of biological knowledge collected for the areas. It should be noted that all of the areas were at least originally surveyed in the mid 1970s as part of the Ecologistics study.

The first category includes those areas that have had a "high degree" of biological information available. This group includes: Beverly Sparrow Field, Beverly Swamp, Borer's Falls/Rock Chapel, Christie Conservation Area, Copetown Bog, Dundas Valley, Fletcher Creek Swamp Forest, Hamilton Golf and Country Club, Hamilton Mountain/Radial Line, Mountsberg Wildlife Area, Red Hill Creek/King's Forest, Royal Botanical Gardens/Cootes Paradise, and Valens Conservation Area. For these areas it is possible to at least get a grasp on the biological status of the ESA in question, and a recent listing of known species of flora and fauna exists or can be compiled that identifies the major forms of plant and animal life located there.

The original Ecologistics report has been supplemented since the mid-1970s with additional information, often from applications for permission to develop parts of the site in question, but information on the biological status of the area remains sketchy at best. This category having "some additional biological information apart from the Ecologistics study", includes: Bronte Creek Ravine, Toll Gate Ponds, Crieff Old Field Complex, Westover Wetland and Drumlin Field, Hayesland Forestry and Wildlife Area, Stoney Creek Ponds, Hydro Islands, Lake Medad, the Niagara Escarpment/Devil's Punchbowl East, and the Spencer Gorge.

A third category, described as being "severely lacking in biological information", defines those ESAs where virtually no new work has been done on examining the state of flora or fauna since the research undertaken for the Ecologistics report a decade and a half ago. This group includes: Carlisle Swamp, Donald Farm Wetland, Felker's Falls/Niagara Escarpment, Forestry and Wildlife Area, Millgrove Woodlot, Rockton Wetland, Saltfleet Woodlot, Sinclairville Lowland Forest, Tiffany Falls, Tweedside Forest, and Woodburn Floodplain.

With the exception of more specific studies underway at the Ministry of Natural Resources, current efforts to ascertain the general state of affairs of the flora and fauna within the Region has been almost completely limited to the ongoing studies undertaken by the Hamilton Naturalist's Club. This non-profit community organization is now completing an intensive study of reptiles and amphibians throughout the Region, and should be finished sometime in late 1990. While surveying reptiles and amphibians on numerous 2 km. square plots throughout Hamilton-Wentworth, Naturalist Club members have also been able to collect data on rare birds and plants. Other recent studies by the Club have included a compilation of bird sightings, a breeding bird survey and a collaboration with the Hamilton Region Conservation Authority on a preliminary botanical survey intended to precede a much larger Regional biological inventory. The Hamilton Naturalist Club is currently spear-heading efforts to complete a biological inventory. This will entail the collection of information on virtually all flora and fauna in the Region.

Although it is beyond the scope of this discussion to list the extremely large number of species of wildlife, fish and plants that still inhabit Hamilton-Wentworth, it should be mentioned that a substantial number of unique flora and fauna still live in the Region. Phenomena such as urban sprawl, water pollution, and the drainage of wetlands continue to threaten the continued existence of these species in the Region, but the extent and the immediacy of the threat is not well understood, particularly because of the aforementioned inadequacy of biological inventories in even those areas designated as environmentally sensitive areas. The 1988 Goals, Problems and Options Discussion Paper prepared through the Harbour Remedial Action Plan process consolidated information on wildlife in the Hamilton Harbour watershed. It was reported that sixteen rare mammals, 25 rare fish, 53 rare breeding birds, and 22 rare reptiles and amphibians have been identified in the Hamilton-Wentworth Region.

2.3.4.1 Environmentally Sensitive Areas

The Region of Hamilton-Wentworth's Official Plan contains a section that designates thirty-seven areas in the Region of varying size as Environmentally Sensitive Areas. Certain safeguards were included in the development-approval process for these areas in the hope that critical environmental elements found in these areas would be protected if and when residential, industrial or commercial development were proposed on the properties in question. (See Map in Aggregate Section)

Unfortunately, dealing with a concept like "environmentally-sensitive areas" is no easy matter, particularly where municipal planning controls are required and no definitive scientific explanation of the concept exists. Any evaluation of what or what isn't an environmentally-sensitive area is in the final analysis a subjective process. The environmental status of all land within Hamilton-Wentworth will have a bearing on the overall environmental health of the Region, and it is difficult to select certain areas or properties, explicitly delineate them geographically, and then state that it is necessary for the environmental "health" of the Region to retain them in their current state.

The approach taken in the Official Plan implicitly recognizes the unacceptability of prohibiting all development in all forests, woodlots, wetlands, floodplains, watercourses or other breeding grounds for wildlife. Nevertheless, the stated objective of the policy is to protect specified areas to the fullest extent possible. Only areas noted for certain types of environmental criteria were chosen for the designation of Environmentally Sensitive Area.

LAND

The Environmentally Sensitive Areas now included in the Region's Official Plan were chosen as the result of a selection process undertaken in 1975 and 1976 by the Region's four conservation authorities and an ecological consultant under the guidance of the Regional Planning and Development Department. Different parts of the Region noted for their vegetation, topography, wildlife, size, and uniqueness in Hamilton-Wentworth were analysed for their physical and biological attributes. They were then given a rating of A, B or C denoting the relative importance of the area according to the research criteria.

In particular, the following nine criteria were used to evaluate the different areas being examined:

1) The area represents a **distinctive and unusual landform** within the municipality, Ontario and Canada.

2) The area serves a **vital ecological function** such as **maintaining the hydrologic balance** over a widespread area, i.e. it serves as a water storage or recharge area.

3) The **plant and/or animal communities** of the area are identified as unusual or of **high quality locally** within the municipality, Ontario or Canada.

4) The area is an **unusual habitat** with limited representation in the municipality, Ontario or Canada, or a small remnant of particular habits which have virtually disappeared within the municipality.

5) The area has an **unusually high diversity of biological communities** and associated plants and animals due to a variety of geomorphological features, soils, water, sunlight and associated vegetation and microclimatic effects.

6) The area provides **habitat for rare or endangered species** that are endangered Regionally, Provincially or Nationally.

7) The area **is large and undisturbed**, potentially affording a sheltered habitat for species which are intolerant to human disturbance.

8) The location of the area, combined with its natural features, make it particularly **suitable for scientific research and conservation education purposes.**

9) The combination of landforms and habitats is identified as having **high aesthetic value in the context of the surrounding landscape** and any alteration would significantly lower its amenity value.

Areas were rated either A, B or C according to the number of criteria which the area fulfilled, with the sole exception of one area which was given an A status even though only two criteria were fulfilled. This exception was included because the area in question is the last remnant of a once very common habitat in the Region. Areas fulfilling four or more criteria were given an A rating, areas fulfilling between one and three criteria were given a B rating, and areas fulfilling none of the criteria listed were given a C rating in the Ecologistics Report compiled by the four conservation authorities. Only those areas given an A or B rating were deemed important enough to be included in the Region's Official Plan as Environmentally Sensitive Areas. Of the 44 areas looked at in the Ecologistics Report, 37 areas merited an A or B rating and were included in the Official Plan.

The ESAs included in the Official Plan of Hamilton-Wentworth comprise some 29,676 acres and approximately 10 percent of the Region's land area. Most of these areas are concentrated in the western and central parts of the Region i.e., in or near the Dundas Valley and the central-western portion of Flamborough. In fact, development in Environmentally Sensitive Areas is predominantly an issue in Ancaster, Dundas and Flamborough, where new residential construction in the Dundas Valley and along the Escarpment is threatening many pockets of unique physical and biological attributes. One noteworthy exception to this geographic focus on development of ESAs is the Red Hill Creek/King's Forest area where the freeway project created much debate and consternation over the destruction of species, habitat and other natural features. Opponents of the North-South portion of the highway have exhausted the legal appeals available to stop the project. Construction is expected to be phased over the next ten years.

The ESAs were incorporated into the Official Plan along with a number of policies. The most specific is the proviso that certain extra steps in the planning process would have to take place before development would be allowed to take place in these areas. Once designated in the Official Plan, Environmentally Sensitive Areas are protected by the provision that any substantial changes within an environmentally sensitive area (i.e. those requiring development approval) are to be preceded by an Environmental Impact Statement (EIS), or a request for a waiver from an EIS, that satisfies Area Municipal and Regional Council that no severe damage will result to the ESA's unique environmental attributes.

LAND

The Region's Official Plan policies with regard to the ESAs can be divided into two parts:

1) those that are administrative in nature and are purely reactive to development pressures; and

2) those that are proactive or program-like in nature.

It is important to note that in preserving the attributes which identify the ESAs, much of the land in specific areas is owned privately. This makes both development control and potential acquisition of these lands, major issues for the Regional Government.

From an administrative, or development control and planning, perspective, the Official Plan demands that any new changes to the boundaries of an ESA or any new development within the boundaries of an ESA should take place only after an Environmental Impact Statement has been provided to Regional staff. Such Impact Statements are to include an inventory of the biological and physical attributes of the properties in question, a study of the potential impacts of any proposed development, and plans to mitigate any adverse impacts the new development might have on the natural environment. The Environmental Impact Statement can be avoided by obtaining a waiver from Area Municipal Councils and Regional Council, usually on the recommendation of planning staff from the area municipality in which the ESA exists and the Region.

As far as proactive approaches are concerned, the Region's Official Plan is limited to statements of support for actions by others. In effect, the Region offers little more than moral support to other agencies or individuals for the long-term preservation of the ESAs. As mentioned previously the Region has imposed additional administrative burdens on property owners seeking to build on lands found in ESAs. With the exception of a general statement pointing out that the Regional Government may acquire land in ESAs for the purpose of extending existing Regional forests, establishing new Regional forests or the establishment of Regional parks, the Official Plan limits the Region's role in acquiring those lands found in the ESA to encouraging the Conservation Authorities and the Royal Botanical Gardens in purchasing property within the Regional ESAs.

Little information exists with which the Region's policies can be judged as either a success or a failure. The Hamilton Region Conservation Authority has had some success in acquiring lands that have been designated as Environmentally Sensitive Areas in the Hamilton-Wentworth Official Plan. This success is not directly attributable to the Region's efforts. Thus the primary effect the Region's official policies have had on the ESAs has been on proposals for new development within these specific areas.

The waiver provision of the ESA policy allows for judgement about whether the requirements for an EIS for minor types of development or redevelopment are warranted. Additions to existing residences, the construction of a new pool or a larger driveway, and the construction of only one or two single dwelling units in a residential area still covered by the ESA designation could easily fall under this category. Regional Council would likely feel it unnecessary to require an Environmental Impact Statement for a proposed construction of a garage next to house found near the Escarpment, so the EIS waiver proviso was included in the Official Plan.

However, in the first decade of the Official Plan's enforcement, forty-nine waivers were given for the development of land in ESAs without the prior preparation of an environmental impact statement. Many of these waivers were given to allow landowners to carry out minor improvements, such as the construction of a new garage or a single family dwelling. In most of these relatively unimportant cases the site had already been extensively disturbed or altered by previous activities, be they agricultural, industrial or residential, and the provision of a waiver by the Region was clearly justified. However, there were cases in which relatively large subdivision plans in ESAs were given waivers, sometimes as a result of preliminary environmental studies produced by consultants hired by the developer in the place of an actual Environmental Impact Statement.

Some ambiguity would appear to exist as to exactly what type of study or promise of mitigation measures is required before a waiver is given or an Environmental Impact Statement is accepted. Basic guidelines exist as to what any landowner must examine in terms of environmental impacts and existing physical and biological attributes of the property in question. Development approval is usually contingent on the developer submitting a list of actions that when carried out in conjunction with the construction would reduce the impact of the new development on the "environmentally-sensitive" attributes found on the property. Essentially the guidelines imply that a consultant should be brought in who will identify the environmentally-sensitive attributes of the development and then suggest ways in which the landowner can develop the property with the least amount of destruction to these important environmental elements.

On the one hand, the process can be viewed as a success if the major goal is to allow development within environmentally sensitive areas with strict limitations on the type and means of development so as to reduce the damage to the local environment that would otherwise occur in standard development situations. On the other hand, if the goal is that these environmentally sensitive areas be largely preserved in their natural state because of their unique importance within the Region, then the process is likely unsuccessful. The wording of the policy in the Official Plan suggests the latter.

The present policy leaves it to the landowner to retain an environmental consultant who will not only specify which areas or attributes, if any, within the property are environmentally significant but will also produce a list of measures that the landowner must implement to mitigate the impact of the development on these areas or attributes. By stressing the mitigation approach the Region is in effect stating that the development of any property in an ESA is permitted as long as measures are taken to reduce the effects of the development on important physical or biological attributes found on the property.

No standardized means of evaluating the relative importance of a property's attributes on a Region-wide basis is utilized by the Regional Planning Department to evaluate requests for permission to develop. It is an open question whether such standardization is possible since in fairness to every property owner, our legal system requires that each case be judged on its own merits. The Official Plan contemplates the development of management plans which could serve to identify those areas within ESAs which are most important but none have been prepared for areas not under the control of public agencies.

A major subdivision planned in one of the Region's most important environmental areas could conceivably be allowed to proceed as long the developer has made some attempt to identify which types of flora and fauna will be destroyed and has provided a scheme for reducing the amount of destruction to those elements. Developers in marginally-important parts of ESAs can produce reports assembled by consultants that relieve the developer of all special responsibilities to the environment by giving evidence that the area in question has never or no longer contains any of the elements specified in the 1976 Ecologistics Report used as the basis for assigning the ESA designation. Clearly, the outcome allows development to proceed in all parts of the Region's ESAs, so long as certain efforts are made to reduce the damage.

Efforts are underway within the Planning Department to examine the policies and procedures regarding ESAs. However, this is not a simple problem that can be quickly resolved through simple changes in planning regulations. A range of alternatives is probably the answer.

If the Region is to effectively contribute to efforts to save environmentally important natural areas within its borders, management plans incorporating stricter policies might be required to ensure that the most important areas are preserved. It might be necessary for the Region to pursue policies (for instance a change to the Regional Official Plan) that would allow it to turn down requests for certain types of development altogether if these forms of development threaten important environmental attributes that have been evaluated according to a standardized system. At some point, however, as regulations become increasingly restrictive it would be time to consider an acquisition strategy so that everyone in the Region shares the forgone revenue of individual property owners.

In those cases where no development would be preferred, the Region might be morally and perhaps legally obliged to purchase the property from the landowner, since such a denial of development potential might be equivalent to expropriation. For this reason a closer connection between the Region's ESA policies, policies regarding acquisition of environmentally-important areas and program options is likely to be considered. Conservation easements, stewardship agreements and assessment levy reductions are avenues short of heavy-handed regulation worth investigating.

Areas of Natural and Scientific Interest (ANSI's)

ANSIs are not to be confused with the ESA designation. ANSIs are not given any special protection through Provincial legislation but these sites warrant mention in any review of the Region's policies with regard to the environment. The Ministry of Natural Resources has designated ANSI's throughout the Province, based on either the unique or important biological or physical characteristics of the areas in question. The principle of representation for earth science sites is to protect examples of features which illustrate Ontario's earth science history. Designation as a life science representation is given for areas that are noted for the protection of Ontario's distinctive vegetational environments.

In Hamilton-Wentworth there are seven designated Areas of Natural and Scientific Interest noted for earth science attributes: Devil's Punch Bowl in Stoney Creek, Dundas Valley in Ancaster, Freelton Esker in Flamborough, King City Quarry in Flamborough, Spencers Creek Bedrock Gorge in Flamborough, the Westover Area in Flamborough, and Grindstone Creek in Flamborough.

There are six designated Areas of Natural and Scientific Interest in the Region noted for life science attributes: Beverly Swamp in Flamborough, Cootes Paradise Drowned Valley in Dundas, Dundas Valley Forests in Ancaster, Niagara Section Escarpment in Stoney Creek, Sinclairville Meander Basin in Glanbrook, and Spencers Gorge Escarpment Valley in Flamborough. Only the Sinclairville Meander Basin and King City Quarry in Flamborough are not portions of ESAs in the Official Plan.

2.3.4.2 Wetlands

Many of the Hamilton-Wentworth's environmentally sensitive areas are wetlands. Although many people regard wetlands as little more than insect-infested swamps providing an obstruction to further urban development, wetlands are both diverse in nature and extremely beneficial to both the environment and neighboring urban areas.

Wetlands can be divided into several categories according to the physical and biological characteristics of the wetland: swamps, fens, mires, marshes, bogs, sloughes and peatlands. The one common characteristic held by all of these types of wetlands is the presence of shallow water above the ground during much of the year, including spring and early summer.

From a biological perspective, wetlands are invaluable breeding and feeding grounds for numerous species of birds, animals and fish. Abundant insect and plant life in wetlands provide the basis of an intricate food chain that is usually more extensive than that found in dry land areas, and as a result these areas are ideal for activities such as sport fishing, bird watching and other human activities related to the environment. Wetlands can also be a useful source of natural products such as fur, wood and wild rice, and are often the last remaining habitats of endangered species. Wetlands are instrumental in populating nearby land and lakes with birds, insects and amphibians that have to breed in shallow or stagnant water, and are therefore more important to the ecology of much larger areas than a preliminary inspection would indicate.

From a land-use perspective, wetlands are now acknowledged to be a major force in flood control and watershed protection. Wetlands can absorb immense amounts of water during wet periods when runoff threatens to create flooding conditions along creeks, rivers and lakes. Then, as water becomes more scarce and neighbouring areas become drier, wetlands slowly release water to adjacent areas or simply retain a relatively-dependable reservoir. By absorbing and often releasing water in this way water courses are regulated even when weather conditions become erratic. As a result erosion near rivers and streams is diminished or avoided.

Perhaps the most important water-regulation aspect of wetland water absorbtion capabilities is the ability of this type of land to absorb vast amounts of storm runoff during the summer months when wetlands begin to run low on water. It is during these dry summer months when wetlands best carry on their "sponge" function of reducing flooding. Wetlands are thus a major factor in reducing the amount of suspended solids that wash down rivers into lakes and the amount of damage done to farms and urban areas further downstream by high water.

LAND

The Ontario Ministry of Natural Resources has produced a classification of the individual wetland areas according to percieved importance. The most important wetlands have been rated as class I, those of significant importance rated as class II, while others are rate as class III. Class I and II wetlands have been defined by the Ministry of Municipal Affairs in conjunction with the Ministry of Natural Resources as those which:

1. Contain habitats of critical importance to fish and wildlife populations (Habitats required for the maintenance of healthy fish or wildlife populations of importance to achieving provincial management objectives); and/or

2. Have an essential hydrological role in the watershed where they exist; and/or

3. Have a significant social or economic benefit

In the Hamilton-Wentworth Region, ten wetlands are listed. Eight are identified as class I wetlands. One wetland is in class II, and one wetland is in class III. Class I wetlands are listed as follows: Cootes Paradise, Beverly Swamp, Hayesland Swamp, Fletcher Creek Swamp, Valens Reservoir and Swamp, Vanwagner's Marsh, Sheffield-Rockton Wetland, and Binbrook Reservoir (Lake). The Sinclairville Meander Basin is identified as a class II wetland, and Vinemount Swamp is identified as being a class III wetland. As the listing shows, Hamilton-Wentworth has a relatively large number of substantial wetlands. This is an important environmental attribute in an area noted for its rapid destruction of wetlands.

Large-scale drainage of wetlands for agricultural, residential and industrial purposes in Southern Ontario has led to a situation where only approximately one-fourth of the area's original wetlands survive. In Hamilton-Wentworth, for instance, the abundant wildlife and complex ecosystem located in the extensive marsh and swamp area that once existed on the southern side of Hamilton Harbour has been effectively destroyed by landfill and encroachment by Hamilton's industrial complex. The fact that Hamilton-Wentworth, and in particular, Dundas and Flamborough, still retain large sizeable acreages of relatively-undisturbed wetlands imposes a special responsibility on, and provides opportunities for, the Region's government and other levels of government. In the recent past, land-use conflict between wetland and agriculture has been the most important factor in the loss of wetlands.

The Hamilton Region Conservation Authority has done the most to ensure that the Region's most important wetlands have been preserved. With funds now available from the Ministry of Natural Resources, the Wildlife Habitat Canada Wetlands Acquisition Program, the Carolinian Canada program, and its own financial resources, HRCA has managed to purchase approximately 470 acres of land at Fletcher Creek and approximately 1326 acres of land in the Beverly Swamp. HRCA's goal as set out in 1966 was to purchase or acquire as much land as possible in the 730-acre Fletcher Creek area and the 2300-acre Beverly Swamp. The better part of the Beverly Swamp and Fletcher Creek acquisitions were made using the 50 percent Provincial subsidy and local levies. Future land-purchase plans may rely more heavily on non-Provincial sources of funds. HRCA intends to continue purchasing land in wetland areas of Hamilton-Wentworth and preserving these lands in their original state.

Recently the Hamilton Region Conservation Authority anounced that it had received approval from the Ministry of Natural Resources to acquire 25 hectares or 62 acres of swampland near Westover. The Conservation Authority is now permitted to seek financing for the deal from a number of outside authorities such as the Wildlife Habitat Canada Wetland Acquisition Fund to supplement its own funds. This swampland had been designated as a Class 1 wetland by the Province, and is commonly referred to as the Hayesland Swamp.

The Hayesland Swamp is listed as being the third most important wetland in the Region of Hamilton-Wentworth after Cootes Paradise and the Beverly Swamp because of its unique physical, biological and recreational attributes as well as its effects on local drainage and water course systems. The Hayesland Swamp is important for the regulation of water levels and erosion in Spencer Creek. By helping to maintain the swamp in its natural state, the purchase by the Authority will assist landowners downstream avoid severe flooding as well as maintain the stream's water levels well into the summer.

It should be noted that the pace of destruction of Hamilton-Wentworth's wetlands in the past two decades has slowed considerably from that which took place during the second half of the 19th Century and the first half of the 20th Century. Virtually all of Hamilton's wetlands had been drained or developed by 1965, and much of the wetlands found in Ancaster and Glanbrook had been destroyed to make way for agricultural or urban expansion by that time. Flamborough alone retains much of its original wetlands, including the relatively-large Beverly Swamp. Environment Canada maps show that two centuries ago the areas that are now Flamborough, Glanbrook and Ancaster were comprised of between 20 and 40 percent wetlands. Maps revealing the composition of the same areas in 1982 show that only Flamborough was rated as having between 5 and 20 percent of total land as wetlands, while Glanbrook and Ancaster were rated as having between 0 and 5 percent of the total land as wetlands.

LAND

Between 1967 and 1982 the destruction of wetlands slowed. During this period a net loss of under 50 acres was registered by the Inland Waters and Lands Directorate of Environment Canada. Although approximately 570 acres of land in Hamilton-Wentworth was converted from wetland to other uses between 1967 and 1982, an almost equivalent amount of marginal agricultural land was converted back into wetland. Of those lands converted from wetland uses to other uses during the same period, 210 acres went to intensive agricultural activities such as crop production, 270 acres went to low intensity agricultural uses such as cattle grazing, 40 acres went to recreational uses and 50 acres were converted to extractive uses.

Today the threats to wetlands would appear to be a gradual displacement of agricultural uses by urban expansion and the expansion of aggregate extraction. Many of the Region's wetlands are designated in the Official Plan as being Environmentally Sensitive Areas, and are thus given some measure of protection against development pressures.

Cootes Paradise, undoubtedly the best known of the Region's wetlands, has seen a rapid decline in size and diversity of vegetation and wildlife in the past half century, largely because of the introduction of man-made or man-introduced elements into the ecosystem. In 1934, some 85 percent of Cootes Paradise was covered with marshland vegetation. After decades of neglect and abuse less than 15 percent of the area is now covered with this type of vegetation.

This steady decline in marshland vegetation and associated wildlife has been attributed to three major reasons:

1) Increased loadings of suspended solids coming from Spencer Creek into the eastern end of the wetlands have clouded the water considerably. These sediments are resuspended by the unhampered wind and wave action that has grown as a result of the decline of the surface vegetation.

2) The introduction of carp, a type of fish indigenous to Eurasia, has led to a steady decline in other types of fish in Cootes Paradise and Hamilton Harbour. In their breeding and feeding activities, carp are noted for damaging and uprooting vegetation as well as stirring up sediments and adding to the level of turbidity in the water.

3) The badly-timed seasonal water fluctuations brought about through artificial means to allow navigation in Hamilton Harbour combined with the already scarce littoral zone has virtually stalled the growth of emergent marsh plants. This effectively destroys the ability of current groupings of marshland vegetation from expanding in size beyond their present locations.

The result of these three factors has been a rapid decline in the health of the marshland vegetation communities and associated forms of wildlife, and an increase in the amount of suspended solids in the water. Unfortunately, an increase in the amount of suspended solids in the water creates not only a polluted environment for fish but also reduces the amount of light penetration, which results in a decline in the size of the population of submergent aquatic macrophytes. Since the whole aquatic food chain is based on these microscopic organisms, an increase in the amount of suspended solids in the water will almost inevitably lead to decline in size of nearby fish populations.

The Royal Botanical Gardens, in conjunction with Ducks Unlimited, is planning to rehabilitate the marsh ecosystem. It is hoped that the project will not only reintroduce marshland vegetation and wildlife to Cootes Paradise on a major scale, but will also reduce the amounts of suspended solids passed from Cootes Paradise into Hamilton Harbour. It is apparent that only a man-made solution can now overcome the substantial and otherwise irreparable damage done by human activities over the past century, and that significant interventions are now required to stem the decline in the natural wetland conditions historically found in Cootes Paradise.

2.3.4.3 Woodlots and Forests

A substantial part of the Region is covered by woodlots or forests. The majority of woodlots, forests and wildlife sanctuaries covered with trees are located in the western half of the Region, primarily in Flamborough but also in Dundas and Ancaster. More than 15,000 acres of forested land remain in Flamborough, where there are numerous Woodlot Improvement Act and Water Conservation-Forest policy areas. This area municipality is by far the most important source of wood products in the Region. Virtually no forest land exists in the City of Hamilton. The trees which remain are in park areas, along the escarpment and in isolated pockets of steep undevelopable areas. (See Urban Forestry discussion.) As the result of development Stoney Creek has also witnessed the almost complete elimination of woodlots and forests within the urban boundary.

Hamilton-Wentworth was at one time the site of extensive forestation, and still has a very diverse and interesting range of forest vegetation in those areas where urban encroachment has not been complete. Hamilton lies within the transition zone between the hardwood-deciduous forest to the south and the mixed conifer-hardwood forests to the north. The forests here contain types of species usually found only in one of the two forest zones. Due to a relatively moderate climate, this Region, along with a small number of other Southern Ontario Regions or Counties such as Haldimand-Norfork, Essex and Niagara, contains Canada's only Carolinian Forests. Hamilton-Wentworth's remaining forests are therefore somewhat unique within Canada.

LAND

The vegetation in our area has gone through numerous and very substantial changes over the past 10,000 years. Disease, climatic change, agricultural practices and now pollution have all played a role in the evolution of the Region's forests, creating a situation in which the search for a "steady-state" environment for the area's forests based on some historical model would be futile. Variations in large vegetation species across the Region can be largely explained by man's past actions and, in the case of undisturbed areas, by the soil-moisture conditions. People's role as an agent of change in the ecosystem and in the evolution of forests, began long before European settlers arrived in Ontario and began to introduce new tree species and started to destroy indiginous trees to make way for agricultural pursuits.

In the Hamilton-Wentworth Region a large group of Iroquois carried on a form of slash-and-burn agriculture for at least several hundred years, burning maple, oak, basswood, beech, hemlock and whitepine forests on suitable sites to make way for temporarily-productive fields of maize, beans and squash. These Indians tended to avoid wet areas populated by cedar, birch, and other swamp species. Eventually their agricultural activities gradually led to a situation where shade-intolerant trees such as white pine, oak, and poplar began to grow at the expense of shade-tolerant trees such as beech and maple. Nonetheless, by the time settlers began to arrive in large numbers to settle the Hamilton area in the late 1700s, forests were still quite diversified, with quite a variety of flourishing species.

As European settlers began to colonize the shores of Lake Ontario and the Niagara Penninsula in large numbers, the Region's forests were systematically and rapidly destroyed. The timber trade became the primary focus of the colony in the early 19th Century. In the forest clearings created by timber cutting followed intensive wheat farming. By the turn of the century much of the Region's forests had been destroyed by rapidly-expanding agriculture in the heart of the Golden Horseshoe.

What little forest remains today is under threat by increasing urbanization. The existing forest cover in the Region of Hamilton-Wentworth is important not only because of the obvious role it plays in flood-control, erosion-prevention, water retention and recharge, outdoor recreation and wildlife preservation, but because of the broad diversity of the species found in these limited forests; something uncommon in Canada.

LAND

Wood and paper production is responsible for a small percentage of Hamilton-Wentworth's total industrial production. Of 67,000 workers found on industrial properties in 1982, 1000 workers were involved with the paper product and wood product sectors. Nevertheless, four mills and one independent logger still exist in the Region. As in many other parts of southern Ontario, the mills of Hamilton-Wentworth have been forced to increase the amount of trees brought in from elsewhere as the size of the tree harvest in the Region declines. The forest and woodlot sector also contributes to the local economy in the form of jobs provided by "cut-your-own tree" Christmas Tree plantations, many of which are found in Flamborough.

In a world of competing demands for land, forests and woodlots usually lose out as demand for residential and industrial land pushes the boundaries of established urban areas outward. Forested areas can often bear the brunt of the urban encroachment. Today those lands with heavy tree cover are usually those that are protected by physical barriers such as land of differing elevations or sheer distance from urban settlements.

The Official Plan sets out several policies that are intended to promote the protection of existing forested areas and the reforestation of marginal agricultural land. Unfortunately, none of these policies found in the Official Plan give real "teeth" to the regulatory framework to further the acheivement of the intended goals. Tangible activities to save the Region's woodlots and forests have been left up to the Conservation Authourities and the Ministry of Natural Resources.

The Ministry of Natural Resources has been involved in a number of actions to ensure that forested areas continue to be a major part of the Region's geography. One of the ways the Ministry acheives its goals is through reforestation programs under the Woodlands Improvement Act. Under the terms of this act the MNR enters into agreements with private land owners in rural areas to reforest the land, usually by directly participating in the planting of new trees in areas that are no longer used for agricultural. With recent changes to the tax rebate system for agricultural land, many land owners in areas such as Binbrook are finding that the minimal returns they are obtaining from rents on agricultural land are not worth maintaining once taxes have been taken into account. These landowners are turning to reforestation as a means of tax relief, and as a result the number of plantings under the Woodlands Improvement Act has been relatively strong in recent years.

In 1990 109,100 new trees were planted, while in 1989 and 1988 the number of new trees planted was 57,900 and 65,400, respectively. Although pleased by the response of the landowners in the Region to the Ministry's program, MNR is somewhat disappointed at the level of difficulty in reforesting agricultural land. Unfortunately, old marginal farmlands are often so eroded that the Ministry is limited in its choice of reforestation species and is often unable to produce the intended results. Ministry plantations are often pine and do not, in the short run, recreate the mixed decidious-coniferous habitat of older forests.

The MNR is also active in the reforestation of the Region through its sale of trees for planting from its St. Williams Nursery, and has been instrumental in raising awareness about the potential for tree planting in Hamilton-Wentworth. The Ministry operates extension services to help landowners with the management of their woodlands, and provides advice and support for Christmas tree-woodlot activities, tree plantation farming, and attempts at reducing tree losses due to insect infestation or plant diseases.

The MNR now feels that many of its attempts at reforestation may have been in vain within the Region because of increasing development pressures on land that has been successfully reforested. Also of concern is the increasingly common practice of landowners benefiting from the Ministry's tree-planting efforts by digging up the trees to sell them for landscape purposes in urban areas. The MNR hopes that more up-to-date policies in the Region's Official Plan and that a Regional tree-cutting bylaw will soon be passed so as to "restrict and regulate the destruction of trees". The Ministry has tried several times to convince the Region that the bylaws and references in the Official Plan related to woodlots and forests be rewritten, but the Region has so far not responded.

The diversity of the Region's forests are now threatened by four factors, two of which may prove to be unavoidable even if a consensus can be reached amongst property owners and different levels of government that the forests should be saved. These factors are; acid rain, urban growth, disease, and natural change. The possible effect of global warming is an additional factor which may affect the long-term species composition of the forests.

Of all the factors affecting Hamilton-Wentworth's forests, none is so little understood or as potentially destructive as acid rain. Although recent studies by the Ontario Ministry of the Environment indicate that there has been no visible increase in the death rates of maple or hardwood species studies in various locations across the province in the past few years experience in countries such as Germany and Poland have shown that whole forests can be decimated by rainfall that is heavily loaded with sulphuric and nitric emissions.

LAND

Some studies have concluded that acid rain's direct effects on trees are insignificant when compared with the indirect effects of acidic precipitation on trees through the destruction of soil micro-organisms, the loss of soil nutrients, and the release of toxic metals into the soil after heavy precipitation containing sulphuric and nitric acid.

Thus, trees may actually die of "natural causes" such as those described below but they may have been weakened by changes in the soils caused by acid rain. We are relatively fortunate that most of Hamilton-Wentworth is rated by Environment Canada as having soils and bedrock that is "moderately capable" of reducing the acidity of precipitation falling here. Some parts of Flamborough and Glanbrook have an even greater capability to absorb and neutralize acidic precipitation. Nevertheless, acid rain remains the threat with the most wide-spread potential to ruin the forest.

Another factor which has to be taken into consideration when analyzing threats to Hamilton-Wentworth's remaining natural vegetation is the growth of residential, industrial and commercial activities into remaining forested areas. If these developments take place in Regionally-defined Environmentally Sensitive Areas, they are somewhat regulated as to the amount of natural environment that can be destroyed.

According to assessment records, between 1982 and 1987, the Region experienced a 1,740 acre reduction in the area of forested land. The drop from 35,855 acres in 1982 to 34,144 acres in 1987 represented a 4.85 percent reduction of the 1982 acreage. (See Land Area by Land Use, Table 2)

One of the two factors over which we have little control and that is leading to the destruction of the diversity and size of forested areas of the Region is disease and destruction by parasites. In Hamilton-Wentworth three major tree species are being or have been systematically wiped out by natural enemies. American Chestnut trees have already almost been eliminated from the forests of the Region by the fungus Endothia parasitica, which was brought to North America around the turn of the century and has managed to drive this type of Chestnut trees to virtual extinction. This disease has had a major impact on the composition of the Region's forests, since in North American forests Chestnut trees were once estimated to comprise up to 25 percent of the total forests. There are some signs that the Chestnut trees may make a comeback.

Another disease that has been around since approximately the turn of the century is Nectria spp., a bark fungus that destroys beech trees. Although the disease has spread across Eastern North American since its introduction to Nova Scotia some nine decades ago and has caused widespread damage of beech in these areas, the beech species will probably survive the onslaught. In those areas where beech has been largely eradicated by the fungus, the beech trees have been replaced by hemlock, birch or sugar maple.

The fungal pathogen, Ceratocystis ulmi, so-called Dutch Elm disease, has led to the destruction of trees. This fungus attacks the White elm species, and has been responsible for destroying much of the White elm stock in wet lowland sites in Ontario and Michigan. Luckily, White elm in upland sites have managed to largely evade destruction, usually because of the lower stand density and high dispersal rate of White elm found in the higher areas.

The most recent threat to Hamilton-Wentworth's forests from natural enemies has been the infestation of the Dundas Valley by the Gypsy Moth. This insect begins its life as a caterpillar that feeds on the leaves of fruit, oak, willow, birch and white pine trees and has been spreading slowly north and westward from the U.S. Eastern Seaboard. Egg counts of 7,000 a hectare have been taken in the Valley, a level of concentration that suggests that up to 40 percent of the area's tree leaves would be destroyed if the infestation were allowed to take place without any type of intervention. Given these estimates, the Hamilton Region Conservation Authority has decided that 300 hectares or 740 acres of the Dundas Valley will be sprayed with the insecticide Bacillus thuringiensis (BT), a compound that is virtually harmless to humans and most animals. The insecticide is a naturally occurring soil bacteria that is only toxic to moth and butterfly caterpillars, which ingest the bacteria as part of their feeding habits. Once inside the caterpillar, the bacteria turns into crystal, making it unable to continue eating. Spraying of the insecticide will begin in late May, 1990, and should be completed in June.

Another factor affecting the forests of Hamilton-Wentworth is the competition of species amongst themselves for the limited undeveloped land remaining, i.e. natural succession. The species composition of forests in Hamilton-Wentworth has been changing and evolving for millions of years, and there are no signs of this process ending now. Major changes in vegetation composition unrelated to human activities have occured during the past 10,000 years, and these changes will undoubtedly continue to occur, if only on a slow incremental basis.

One area related to natural competition over which man does have partial control is the competition between shade-intolerant species and shade-tolerant species. A recent study has indicated that shade-intolerant species such as white pine are declining in many areas as a result of competition from shade-tolerant species. This study points out that certain human activities such as forest-fire fighting is changing the balance of nature, since certain types of trees thrive in areas that have been affected by fires.

Urban Forestry/Naturalizing Open Spaces

Most municipalities in the Region leave the management of natural areas, including forests, to the Conservation Authorities. The Parks and Recreation or Public Works Departments are generally expected to provide soccer fields, baseball diamonds or floral displays etc... This tradition may be changing; Stoney Creek for example, does plan to use native species in preference to exotics in some of its plantings.

In other jurisdictions, such as North York, the living, natural parts of the city are explicitly viewed as part of the ecosystem.

> The urban forest-- composed of thousands upon thousands of trees in ravines, parks and residential streets, back alleys and empty lots--plays a critical role in the city's environment. It takes in prodigous amounts of carbon dioxide (the main culprit in global warming) and gives off the oxygen on which human and animal life depends. At no small cost to themselves , trees filter the city air of carbon monoxide, airborne lead, sulfur dioxide, hydrocarbons and other chemicals. Because a mature tree pulls up hundreds of gallons of water each day through its roots and releases it in microscopic droplets through pores in its leaves, it produces moister air as well. Shelter and windbreak in winter, in summer a tree can cast shade that could reduce air conditioning bills by as much as 20 per cent. (Ohlendorf-Moffat, "September in Summer", Toronto Magazine., p. 30.)

This perspective leads to a different kind of approach to urban greenery. Urban forestry and the naturalization approach are based on the notion of multiple-use as opposed to simply ornamental or active recreational uses of open-space in the city.

LAND

The developing experience in this field can be narrowed down to a few central ideas:

1. Planting of a diversity of native species.
2. Low interference; i.e. minimal management and biological pest control.
3. Selective harvesting.
4. Habitat development and rehabilitation; i.e. landscaping for wildlife.
5. Allowance for a variety of human uses, (multiple-use).

The adoption of such practices will likely be a more common feature of parks planning as well as public works in general. These practices may also create some controversy since many people hold contrary aesthetic ideals. For instance, many people continue to consider ravines convenient places to dump garbage, while old fields with tall grasses are simply seen as vacant or messy places.

2.3.5 Waste

Traditionally waste has been buried in the ground. Many areas of Canada and Southern Ontario are now finding that landfilling and incineration are not the only solutions to the "garbage problem". Some cities such as Toronto are reaching the limits of their ability to throw unsorted household and industrial waste into existing landfill sites. On the other hand, reduction and alteration of these wastes through incineration poses technical challenges to controlling the emission of dioxin and furans into the air.

It has been estimated that Ontario will run out of landfill sites for half the population by the end of the decade. Potential solutions such as blue box recycling programs are not currently dealing with the volume of garbage produced at a fast enough rate to avert the foreseen crisis in many areas of the province. However, the Regional landfill site is expected to have enough capacity to meet Regional landfill needs for the next two decades.

Municipal solid waste is not the only area where our methods of transporting and disposing of unwanted substances has come into question. The tanker turned away from European ports carrying Canadian PCB contaminated waste and the decade long search by the Ontario Waste Management Corporation for a suitable home for a toxic waste treatment facility have been among the events which emphasize the point that it is no longer possible to operate with an "out of sight, out of mind" mentality when it comes to waste materials.

2.3.5.1 Solid Waste Management

As a society, the per capita figures for Canadian waste production are not very positive. On average, over a tonne of residential, commercial and industrial garbage was produced by each Canadian last year and the figure is still growing. While many people view waste management as a government problem, the reality is that the garbage problem begins at home and in the supermarket.

The average Canadian produces almost a half tonne of residential waste each year that has to be disposed of through municipal garbage collection and recycling programs. Food and yard waste, primarily biodegradable materials, comprise approximately one third of this garbage, while newspaper accounts for about 10 percent of the total. Box board, fine papers, magazines and corrugated cardboard make up another 30 percent and metals comprise about 5 percent, while glass and plastics comprise 7 and 5 percent respectively, of the average individual's residential solid wastes.

LAND

In 1989, the amount of solid waste picked up from residential areas in Hamilton-Wentworth weighed 139,883,000 kilograms, which works out to approximately .9 kilograms per person per day for each person in the Region. This compares to U.S. estimates of 1.3 kilograms by the average person daily. However, estimates of per capita garbage creation are not necessarily easily compared since the method of calculation can differ.

Using the average number of persons per household in the Region, we can calculate that each residence produced approximately 2.24 kilograms of solid waste per day, or 818 kilograms of solid waste per household per year. With about 332 kilograms of solid waste per person per year collected from residential areas, Hamilton-Wentworth is in better shape than the average for the rest of the country in per capita solid waste production. This calculation does not include the waste hauled away from stores and other businesses who contract the removal of garbage privately.

The storage, elimination or disposal of solid wastes is the responsibility of the Region, and as a result Hamilton-Wentworth maintains a number of services and operations related to waste management. The Region of Hamilton-Wentworth has attempted to address the problem of waste disposal by preparing long-range plans to deal with waste produced within the Region's boundaries and by setting up, or supporting, various organizations and processes to reduce the need for landfilling. Emphasis has been placed on incineration, recycling and recently municipal composting as ways to reduce the need for landfilling. The preparation of an overall waste management strategy is in the works for 1990-1991.

Regional management can only solve certain aspects of the problem. A co-operative effort between industry, commerce and citizens is necessary to ensure that: the amount of residential waste is reduced, that objects that can be recycled are recycled, and that dangerous or toxic materials that cannot be recycled are given to local authorities in separate containers at the times when the Region offers its special waste disposal programs.

Ultimately, reduction and reuse are primarily the responsibilities of the people that purchase and consume products that generate garbage in the first place. The convenience and successful marketing of a disposable lifestyle has become an expensive problem for municipalities. Advances in recycling technology, or manufacturing processes that use less original materials, will help reduce overall levels of garbage. However, to deal with the high general level of consumption consumers will have to show the producers of consumer goods that they value durability and are willing to pay for it.

Materials such as paint, antifreeze, turpentine, batteries, smoke detectors, disinfectants, rodent poisons, insecticides, used motor oil, polishes and paint thinners, and oven cleaning solutions should not be mixed with standard residential solid wastes. When deposited in large quantities in landfills these seemingly small quantities of common materials can produce a toxic brew as the chemicals mix together with rain water and then seep into nearby groundwater. Leachate collection systems are now a standard feature of new landfill sites, however these leachates must then be dealt with as toxic waste. This leachate can be pumped to the Sewage Treatment Plant or simply pumped back into the landfill.

The leachate monitoring program at the Glanbrook Regional Landfill site has so far determined that no problems with migrating leachate now exist. The Region is also monitoring and collecting leachate from the former Upper Ottawa Street landfill site. Leachate collection systems are not in place at each old Landfill site in the Region some of which are adjacent to creeks. By 1980, the ten landfill sites inherited by the Region when it was formed were closed to MOE standards. A monitoring program of the abandoned sites was initiated to warn of the emission of excessive gases or leachates. The Ministry of Environment is currently reviewing a consultant's report on testing procedures for the old landfill sites.

Household Hazardous Waste Programs provide the average citizen the opportunity to dispose of dangerous chemicals, oils and various paints without mixing these substances into their garbage or into nearby sewers. The Region successfully conducted six household hazardous waste sessions in 1989 in which residents of Hamilton-Wentworth were able to dispose of dangerous or toxic household materials at a predetermined drop-off point. 257 forty-five-gallon drums were filled with hazardous wastes ranging from paints to arsenic. The wastes collected also included 435 car batteries and 237 propane cylinders. Without the opportunity to dispose of these materials appropriately it is likely that much of the material would have ended up in the Glanbrook landfill site. Regional Council has approved the establishment of a permanent Hazardous Waste Depot which will open each weekend for citizen use.

The six programs were operated at a cost of just over $160,000. The Region paid $140,000 of the total while the Ministry of the Environment contributed $20,000. Household hazardous waste programs of this sort will likely be promoted even more in the future.

LAND

The Region's solid waste disposal program now in place was initiated in 1980 after several years of planning and hearings before the Environmental Assessment Board and the Ontario Muncipal Board. Tricil Ltd., (now a part of Laidlaw Waste Systems) was awarded the Regional contract for the operation of the entire waste management system which included three transfer stations, the Solid Waste Reduction Unit (SWARU) and the new Regional Landfill Site in Glanbrook.

One of Laidlaw's primary duties is to manage the 537-acre landfill, which has a total waste handling capacity of 6.2 million tonnes or approximately 500,000 cubic yards and is located in the south-eastern corner of the Region. Assembling the land and preparing the site and roadways cost the Region $3,640,000, a sum that will be depreciated over the landfill's estimated 30 years of operation.

According to current Regional Engineering figures, the quantity of garbage disposed of at the Regional landfill in Glanbrook reached a peak of 282,046 tonnes in 1986. This was during a period when the SWARU was undergoing modifications. Since 1986 the total volume steadily declined, with the Regional landfill receiving 249,448 tonnes in 1987, 235,298 tonnes in 1988 and 228,688 tonnes in 1989.

The most important area of waste source reduction appears to be in the area of standard residential, commercial and industrial wastes (as opposed to deliveries of SWARU ash and Sewage Treatment Plant grit), and this source has declined in weight of deliveries from 273,829 tonnes in 1986 to 197,818 tonnes in 1989. (See Figure 24) Due in large part to Regional initiatives sizeable quantities of waste are being recycled through the Blue Box program. Also commercial and industrial waste generators are increasingly aware of the need for, and in some cases the cost effectiveness of, recycling versus disposal.

Approximately 60 percent of municipal solid wastes are received at SWARU and become "refuse derived fuel" (RDF) for the facility. In 1982 a turbine generator was installed at SWARU making the plant the first in Canada to produce electrical energy from municipal waste. In 1986 the pollution control system at the facility was upgraded and recent testing has indicated that SWARU emissions are within MOE air emission regulations. Process changes in the pollution control system are planned for 1990-91 to improve air emissions further.

In 1989 a total of 93,707 tonnes of solid waste was processed through the Solid Waste Reduction Unit. 4,997 tonnes of magnetically separated ferrous material were extracted. Just under half of this metal was sold to local industries. In 1989, the SWARU process also resulted in 26,901 tonnes of incinerator ash being disposed of at the Regional landfill site in Glanbrook.

Recycling

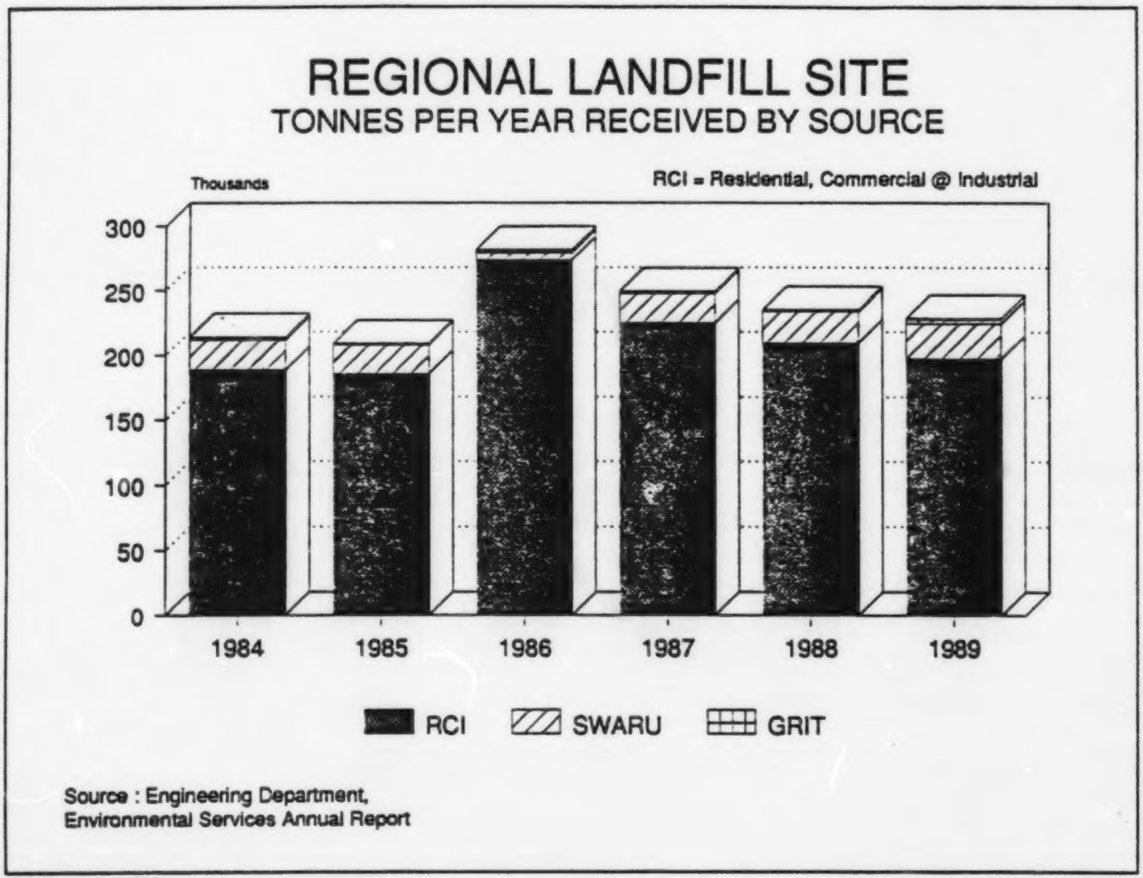
Curbside Recycling has been developing in the Region since 1977, initially through the efforts of Third Sector Employment Enterprises. Third Sector is a non-profit company which collects and processes recyclable materials while providing youth employment through its social services program.

The area municipalities and the Region began contributing financially to the recycling program in 1985 in the form of a diversion credit for materials collected and for the purchase of blue boxes and other recycling equipment. In 1989 the Region contributed to Third Sector Enterprise's capital budget by providing a grant of $230,000 in addition to subsidies of $23.23 per tonne of material collected, resulting in a total contribution of $578,154 to the Third Sector Multi-Material Recycling Program. Effective January 1, 1990, the Region assumed full financial responsibility for the Blue Box recycling program.

Curbside recycling has progressed from bi-weekly collection of newspaper, to Blue Box programs in all six area municipalities. In 1989, 14,987 tonnes of newspaper, glass containers, aluminum and steel cans, and PET plastic soft drink containers were collected from approximately 110,000 households across the Region.

The Region plans to build on the success of current recycling activities. Therefore, it has solicited proposals for the provision and delivery of an expanded recycling program, which currently has as a primary objective the meeting of provincially-mandated targets of a 25 percent reduction of waste by 1992 and a 50 percent reduction of waste by 2000. The request for proposals has been divided into two segments; the Phase 1 Request for Proposals that addresses the need for recycling in the traditional municipal waste collection sector; and the Phase 2 Request of Proposals that addresses the need for recycling by industrial and commercial concerns that have their wastes hauled by private companies to both private and Regional landfills and waste disposal sites. The Region sees a need to expand recycling in a number of areas, and optimistically looks to the possibility of eventually recycling up to 50,000 tonnes a year.

In addition to expanding the Blue Box recycling program to include apartments, rural areas, small businesses, offices and institutions, the Region forsees the recycling of large quantities of wood, corrugated cardboard and paper as well as the initiation of a municipal composting program. The Region also intends to more stringently enforce the bylaw that prohibits development and renovation firms from disposing of "non-acceptable" wastes such as construction and demolition debris at municipal waste disposal centres.



Source : Engineering Department,
Environmental Services Annual Report

Figure 24

It has been estimated that recycling corrugated paper could reduce landfill requirements in the Region by 8,000 tonnes annually or 3 percent of the current landfill waste stream. Diverting wood would probably result in a reduction of landfill requirements of the same magnitude again, assuming that improved waste stream control would effectively eliminate larger deliveries of wood debris.

The Region has been spending about half a million dollars a year on recycling subsidies. As the recycling program grows proportionate commitments of funds will be necessary. The Region of Durham, a pioneer in recycling in Ontario, is finding that recycling can be a very expensive proposition when done on a very large scale. With costs for 1990 estimated at $3.75 million and revenues expected to be less than $375,000, Durham's recycling program is threatening to cause severe financial difficulties for that government.

In order for the present expansion of recycling programs to continue to be as widely supported as they are presently, proposals for recycling programs in Hamilton-Wentworth will have to be cost-efficient. The rapidly expanding costs of disposing of wastes in landfills or through incineration will increasingly make recycling the logical means of waste elimination both from a financial as well as environmental viewpoint. In the past it was not expected that traditional waste disposal methods pay their own way, it is probably unrealistic to expect recycling programs to necessarily operate on a full cost-recovery basis.

Although the public sector is primarily responsible for waste disposal and recycling in the Region, a number of important activities are carried on by the private sector. There are four privately licenced landfill sites in the Region. Scrapyards, the beverage producers and numerous other private sector industries are heavily involved in the recycling of materials such as newspaper, glass bottles, plastics, metal cans, corrugated cardboard and old cars that would otherwise be considered waste.

Steetley Landfill Proposals

Perhaps the most controversial aspect of the private sector initiatives in the waste management business is the operation of landfills. While private sector efforts to manage wastes through recycling are almost universally well-received by the public and various levels of government, the management of landfills by profit-motivated firms is rarely accepted by environmental groups, members of the public or local governments as being an activity beneficial to the local community.

Brow Landfill Site

One such controversial private-sector landfill that has been in the public eye in recent times has been the Steetley Industries proposal to change the contour of its brow landfill site. If accepted the proposal would allow for a greater volume of waste to be dumped there than was allowed under the initial Certificate of Approval issued by the Ministry of Environment. This point is debated by the various parties involved.

The Escarpment Brow Landfill Site is in the Town of Flamborough, and located just above the escarpment near the boundary with Dundas. Given a permit by the Ministry of the Environment to operate a landfill in an abandoned quarry in 1978, Steetley Quarry Products applied for an amendment to its certificate in 1988 that would allow the company to accept waste from areas outside of Hamilton-Wentworth and adjacent regions. MOE allowed an interim extension of the service area under the Certificate of Approval and Steetley began to accept wastes from number of waste disposal contractors in Peel Region and Metropolitan Toronto.

In June, 1989 Steetley Quarry Products asked for another amendment to its permit, this time proposing that in addition to accepting the waste from 5 companies in the Peel and Metro Toronto areas Steetely would like to alter the proposed final contours of the landfill to create a dome-shaped site as opposed to four small mounds with a "V" shaped trough separating the mounds. The company claims that the proposed change in the contours of the landfill would not result in any more waste being dumped there than was allowed under the original estimates included in the original permit.

The company argues that it can continue to accept new non-hazardous solid wastes without any adverse conditions to local groundwater or nearby residents. The Towns of Dundas and Flamborough oppose any new waste deposits at the landfill. Residents believe that additional wastes could lead to the company pumping excessive amounts of leachates from its groundwater-protection system to the Dundas sewage treatment plant or to other leachate-related problems to adjacent properties.

The Region has withdrawn support for the proposal on the basis that guaranties must be made by Steetley Quarry Products that no attempt will be made to dump more waste in the landfill than had been proposed in 1978 and that any increase in the amount of leachate resulting from the operation of the landfill should be dealt with before reaching the Dundas sewage treatment plant. Plans to continue dumping waste from outside of Hamilton-Wentworth into the landfill are not supported by the Region. The Region would prefer to see wastes only from this area dumped there. The fear is that otherwise the landfill will reach capacity quickly with wastes from elsewhere thereby leaving Regional waste-generators with nowhere to dump their non-hazardous solid waste. In principle, the Region has taken the view that each Region should deal with its own garbage.

South Quarry Landfill

Steetley Quarry Products Inc. proposes to develop a 78 hectare non-hazardous industrial landfill with a life-span of about 10-13 years. The proposed landfill would be on the 135 hectare South Quarry site close to the existing Brow Landfill Site but on the North side of Highway 5.

This site would be the largest of its type in Canada. According to the proposal, residential and industrial waste will be accepted at the proposed facility from sources outside the Region and from the Greater Toronto Area. Given that Steetley has another 200 acre quarry just to the North, there are fears that if this proposal is successful the North Side Quarry will also be proposed for use as a landfill. The project requires the preparation and approval of an Environmental Assessment (E.A. Act Section 34 (b)). This assessment includes social, noise, traffic, dust and other environmental impacts. On September 12 1989 Steetley released a draft E.A., " Steetley South Quarry Landfill Development Draft EA", for review by local residents, interest groups and authourities.

Regional Council has authorized the hiring of a consultant to examine the documentation and technical arguments presented by Steetley in order to assist Council prepare its position. Based on an examination of the Draft EA the Hamilton Conservation Authourity is at this point opposed to the proposal. Two citizens groups are fighting the proposal, Greensville Against Serious Pollution (GASP) and a newly formed group. GASP has been told by the Board to share the intervenor funding granted to the Town of Flamborough. A public liaison committee (PLC) has been formed in co-operation with the Towns of Flamborough and Dundas and includes members from various local agencies including the Region.

The Environmental Assessment process offers opportunities for public involvement. However, the positions of the Municipalities on the various issues involved will likely be presented by lawyers and argued through expert testimony at the hearing. In the past, the Region has generally supported private operations that deal with local non-hazardous industrial waste since this is an important component of an overall waste management strategy and Glanbrook does not accept such waste. On the other hand, this proposal by Steetley incorporates the acceptance of residential waste from far afield, a position which Regional Council does not support.

2.3.6 Contaminated Properties

Pressures for the redevelopment of industrial properties have resulted in a growing public awareness regarding contaminated soil, the infamous 'toxic real estate' dilemma. Toxic real estate refers to contaminated property. Contamination can occur in a number of ways, including spills or long-term deposition. Materials commonly associated with contaminated property include PCBs, radioactive materials, pesticides, leakage from petrochemical storage tanks, chemical wastes, and a broad range of industrial byproducts.

How Clean is Clean?

Every piece of land in the province will contain at least tiny amounts of some potentially dangerous material, such as mercury or lead. The question of whether or not a site can be considered to be contaminated is to a large degree a matter of whether or not concentrations of a substance are high enough to pose a substantial threat to people's health. For instance, a piece of property will not be judged toxic if only minute trace amounts of lead are found in the soil on the property. However, if it is determined that sufficient quantities of lead exist in the soil to potentially damage the neurological system of a child playing in the soil for any length of time, the property could be deemed toxic.

Thus, the determination of whether or not a site can be considered contaminated will largely depend on the concentrations of compounds found at that site, and on determinations of the level of danger associated with those concentrations. The establishment of safe concentrations for these compounds in the soil is a component of the Ministry of the Environment's Site Decommissioning Guidelines. Determination of actual soil concentrations is based on an assessment of the contaminants by the company or landowner sponsoring the decommissioning. These levels are then reviewed by the MOE as to their acceptability.

Defining which lands are contaminated and which are not, and defining when a site found to be contaminated is in fact "cleaned-up", can therefore be the focus of much debate. Any examination of the issue of contaminated property will undoubtedly touch on the central question of what constitutes a dangerous level of contamination by some compound or mixture of compounds, and whether the limits of acceptable safety have been exceeded.

LAND

Land Use Change

The issue of toxic real estate is usually associated with attempts to change the land use of a property from industrial to residential, institutional or recreational use. Urban areas in Europe and Asia have historically seen innumerable transitions of land-uses between different types of activities, as have older North American cities like New York and Montreal. In most of these cases it was merely assumed that the previous land-use would have no impact on the new land-use.

A growing scarcity of land available for development close to downtowns and the deindustrialization of central urban areas in North America led to proposals for reusing traditional industrial lands for residential, commercial and institutional activities. Municipalities throughout North America have become accustomed to routinely rezoning lands in central locations from industrial to other uses. The consequences of these actions can be unfortunate, largely because of a lack of understanding of the possible effects of deposits of materials such as liquid chemicals or heavy metals on residents or building occupants above these deposits.

Recent experience with transitions from 20th Century industrial sites to residential or institutional developments has proven this to be the case. Infamous cases such as the residential development at Love Canal have illustrated the potential of chemical residues left behind by industrial activities to threaten the health of individuals unlucky enough to purchase homes on or adjacent to old industrial areas. New schools, apartment buildings, houses or offices built on land that contains chemical wastes or landfill sites pose a health threat to the community.

An associated problem that is growing in magnitude now that sophisticated devices are increasingly capable of detecting small quantities of toxic materials in samples of water or air is the potential for contamination of residents of areas adjacent to industrial activities. It is now becoming apparent that properties have become contaminated as a result of chemical discharges into groundwater, soil, or as a result of lead emissions from automobiles along busy highway routes.

Companies, municipalities and individuals examining the potential purchase of a piece of real estate must now evaluate whether toxic materials were at one time deposited on the individual property in question and also whether or not toxic materials have been or could be deposited on the property from adjacent areas.

LAND

The Extent of the Problem

The full extent of the hazardous materials contamination problem in North America is unknown. In Canada, it has been estimated that there are at least 30,000 industrial sites that are potentially contaminated with toxic materials. All land that has been used for industrial activities related to the production of chemicals, petroleum products, steel, iron and other metals and metal goods, electronics, and plastics, or for the storage or disposal of industrial byproducts and wastes has some level of contamination. Certain commercial activities such as dry-cleaning and printing have also been associated with the contamination of land with dangerous or toxic materials.

Neither the provincial nor the federal governments have attempted to make comprehensive listings of contaminated properties. Therefore, the full extent of the problem is not known, although it can be assumed that there are a substantial number of sites that have not been identified but which contain large amounts of toxic materials. In those municipal areas where attempts have been made to determine the extent of contamination in the soil and substrate of properties in older industrial areas, the results have not been encouraging.

In addition to historical industrial activities, illegal dumpsites on agricultural lands have been identified as a cause of contamination. Agricultural lands can become contaminated due to the use of chemicals in the farming process or due to 'back 40' dumpsites where containers of pesticides and/or other hazardous materials were disposed of improperly or illegally. Consequently, virtually any existing land use may be associated with a contaminated soil site, either as a result of ongoing activities or as a result of activities that took place years or decades before.

Within the Region, a number of sites have been publicly identified as contaminated: the Hamilton Street Railway site, the Lax properties and the Upper Ottawa Street Landfill site and six coal tar sites. In each case the source of the contamination differs.

Heavy metals contaminate the Lax site and site cleanup has been estimated at approximately $9 million. Of particular concern associated with the Lax site is the occurrence of off-site transportation of these materials into the harbour in either the groundwater or in surface runoff. The Province has recently announced that the funds for the clean-up are now available.

Redevelopment proposals have been presented for the Hamilton Street Railway site at King and Wentworth. However, until a full environmental audit is completed, the exact degree and nature of contamination associated with this site is unknown. The HSR site was formally used as a foundry. As such, heavy metal contamination may be a problem with this site. Furthermore, upon a detailed investigation of the site additional contaminants may be identified due to the several transformers (eg PCBs) and underground fuel tanks (fuel contamination) that are on the site.

The third major site within the Region that may be associated with the contaminated soil issue is the Upper Ottawa Street Landfill. This landfill site accepted both solid refuse and liquid industrial waste and was closed and capped in 1980. A gas system flare-off has been installed on the site to deal with gases. This site is governed by all of the relevant regulations in the *Environmental Protection Act* regarding the redevelopment of old landfill sites. The range of possible contaminants present has not been determined but mitigating measures have been implemented to minimize the impact on the surrounding environment. Leachate testing has just been boosted by the Region. There are 10 other old landfill sites which were shut down by the Region to MOE standards.

In addition to these sites, the Ministry of the Environment has identified six coal tar sites, all of which were at one time or another a location for gasification. These sites are in the heavily industrialized Harbour area. The MOE has identified these sites as requiring potentially extensive clean-up efforts.

The Role of Government

Governments at all levels throughout Ontario are increasingly being forced to deal with the issue of cleaning up contaminated property. The clean-up of toxic sites has proven to be an expensive undertaking. Clean-up costs can range from tens of thousands to millions of dollars depending on the degree and/or nature of the contamination. Costs can rise even further if groundwater contamination has occurred.

For example, in Smithville, the provincial government has undertaken a $24 million clean-up in order to protect groundwater from contamination from an abandoned PCB storage facility. The Regional Municipality of Ottawa-Carleton must pay an estimated $12 million for clean-up costs of a coal tar site accidentally uncovered during the construction of an underpass. Further compounding Ottawa-Carleton's problems is a Ministry of Environment (MOE) legal action against the municipality. The MOE is of the opinion that the clean-up was done improperly. The MOE alleges that the procedures employed during the clean-up process failed to contain all of the contaminants and that the Ottawa River was subsequently polluted.

In some cases, severe soil contamination can result in cleanup costs that exceed the current market value of the site, leaving the property virtually worthless. In Niagara Falls, a property owner was able to have property taxes reduced to $1 since the property was deemed virtually worthless in its contaminated condition.

Regulation

Although every level of government has in the past been in one way or another responsible for some aspect of the problem, under the constitution primary responsibility for this matter lies with provincial governments. In Ontario responsibility for the regulation of contaminated sites rests primarily with the Ministry of the Environment, although the Ministry of Municipal Affairs and the Ministry of Consumer and Corporate Affairs also have a hand in the regulation of toxic real estate related matters.

The MOE has a number of legal powers and responsibilities under the Environmental Protection Act and the Environmental Assessment Act and is also responsible for providing guidelines for the decommissioning and clean-up of industrial and land-fill sites. MOE collects data on certain types of existing and abandoned industrial sites, and is also responsible for granting certificates of approval for landfill operations.

The Ministry of Consumer and Corporate Affairs, Fuel Safety Branch, is responsible for the licensing and regulation of underground fuel storage tanks. The Ministry of Municipal Affairs is partially responsible in the area of contaminated sites because of its jurisdiction over all municipal governments within the province. Although the Ministry of Municipal Affairs has to date issued no explicit directives regarding municipal involvement in clean-up efforts or regulatory approaches to the toxic real estate problem, it is conceivable that some new directives will be forthcoming, particularly because of the precedents in this area by American states in recent years.

In Canada, the most extensive approach to dealing with the problem has come from Quebec. The Quebec government requires that all municipalities must withhold building permits in those cases where contamination may be a problem and where residential, recreational or commercial land-uses are proposed. The Quebec Ministry of the Environment has backed up the directive by circulating a list of over 10,000 sites that may be contaminated to local governments, urban planners, developers, and real estate lawyers. Under the new directive developers are now responsible for cleaning up any toxic residue left behind by past land-uses, and property owners are often required to send soil samples to the Ministry of the Environment before construction is allowed to take place.

LAND

In Ontario the landowner is responsible for any necessary clean-up. The Guidelines For The Decommissioning And Cleanup Of Sites In Ontario covers the clean-up of old industrial plants and their associated lands as they close down or are mothballed. The guidelines provide for a process whereby an environmentally safe level of cleanup is determined. After this determination the guidelines set out a process by which the clean-up is carried out and monitored. These guidelines also apply to the clean-up required for old contaminated sites such as coal gasification sites.

The Canadian Government has in the past been active in providing financial support to provinces for clean-up efforts and in acting in an advisory capacity through the various divisions of Environment Canada. Agreements have been made between the provinces and the federal government over who should pay for which contaminated sites. Presently no initiative has been launched by the federal government that would duplicate the role of the United States' 1976 Resources Conservation and Recovery Act and the 1980 Comprehensive Environmental Response, Compensation, and Liability Act. Under the powers granted under these laws, the American Environment Protection Agency is responsible for regulating the disposal, storage, and in cases deemed necessary, the clean-up of toxic wastes. In those instances where a party other than the federal government cannot be held legally responsible for the clean-up costs a substantial amount of federal money is available from a "superfund" to pay for what needs to be done.

At the municipal level the Region is involved in this issue for three general reasons;

1) the moral and Health Department responsibility to protect citizens against harm from hazardous materials found on toxic sites;

2) the potential exercise of the power to refuse to rezone industrial properties to allow other uses unless it has been proven that the properties in question do not contain toxic materials and;

3) the specific legal responsibility acquired by local governments that buy and then sell or utilize properties that are contaminated and;

LAND

Environmental legal experts have stated that a municipality could be held legally responsible for permitting an industrial or landfill site to be rezoned and redesignated, allowing other uses such as residential development, when there existed reasonable cause for suspicion that the site might be contaminated but where there were no tests undertaken to ensure that the site was in fact safe. It is conceivable that it may soon be standard procedure in Ontario for regional and local municipalities to demand consultant or MOE reports from developers that certify that industrial land being converted to other uses is devoid of contaminated materials.

Finally, the most pressing issue for municipalities with regard to the problem is that of ownership and liabilities related to ownership. Provincial legislation related to toxic real estate and Common Law precedent in the fields of nuisance, strict liability, and negligence ensures that not only current owners of contaminated land, but also in many cases past owners of contaminated land, can be held liable for the full costs of cleaning up both the property and all other affected properties that have been proven to be damaged by the contaminants.

Municipal governments have in the past, and will probably continue to be, heavily involved in the purchase of old industrial land as part of economic development schemes, downtown revitalization attempts or the creation of greenspace and waterfront recreational areas. Thus, the liability issue poses serious questions about most local governments' abilities to finance cleanups for any sites these municipalities have been unfortunate enough to purchase. In Hamilton the Lax site is a good example of the complications that can arise when a piece of property a local government has acquired turns out to be badly contaminated.

The major barrier to the development of proactive action is the lack of information. There have not been a great number of environmental information systems created in Ontario that deal specifically with the issue of contaminated sites. The City of Niagara Falls however, has prepared an environmental inventory which includes several components related to hazardous and toxic materials in a computerized Geographic Information System. The information system has been helpful for in locating sites that have contaminated soils, polluted groundwater or other environmental complications. It is worth noting that the information system has provoked less controversy and has provided far more benefits than was originally expected.

The Regional Health, Planning and Engineering Departments all have direct responsibilities that are affected by soil contamination. As well, emergency response agencies like the Fire Departments and Community Awareness Emergency Response (CAER) are involved in spill or disaster situations that often have soil contamination complications. The Region is presently examining the best way to co-ordinate activities .

LAND

INFORMATION SOURCES:

Agricultural Institute of Canada, Canadian Federation of Agriculture, World Resources Institute and others. In Search of Soil Conservation Strategies for Canada. 1986.

Allard, C. (1990) "The High Cost of Polluted Real Estate" in Canadian Business, January 1990, p.19.

American Council on Science and Health. Lawn Care Chemicals: What Consumers Should Know. Summit, New Jersey: April 1987.

Andrews, R.N.L. (1987) "Local Planners and hazardous Materials"in APA Journal, Winter 1987. pp 3-5.

Bachman, G. (1986) "Government Mobilizes for Groundwater Protection Initiatives" in Urban Land, April, 1986, pp36-37.

Baldwin, M.F. (1985) "Hazardous waste Problems: Implications for Developers" in Urban Land, October 1985, pp17-21.

Canadian Centre for Toxicology. Expert Panel Report on Carcinogencicity of 2,4-D. Guelph: Ontario Pesticides Advisory Committee, March, 1987.

City of Ottawa. Policy Report: 3.7 Environmental Management. 1989.

Cu-Uy-Gam, Miriam. "New Laws Keep Waste Industry Refining Ideas", Financial Post, April 26, 1990. p.15

Deelstra, Tjeerd. "The Productive City: Urban Forestry in the Netherlands", in Gordon, David, ed. Green Cities: Ecologically Sound Approaches to Urban Spaces. Montreal: Black Rose Books, 1990.

Deloitte Haskins & Sells. A Profile of 2,4-D Use and Exposure in Ontario. Guelph: Ministry of Environment, Queen's Printer, 1988.

Dr. Peter Rice. Personal Communication. Assistant Director, Conservation, Royal Botanical Gardens. May, 1990.

Ecologistics Ltd. Environmentally Sensitive Areas Study. Region of Hamilton-Wentworth, July, 1976.

Elkin, T.J. State of the Environment Report: Regional Municipality of Waterloo. School of Urban and Regional Planning, University of Waterloo: Waterloo, 1987.

LAND

Engineering Department. *Environmental Services Annual Reports.* Regional Municipality of Hamilton-Wentworth, 1981-89.

Engineering Operations, Solid Waste Management Division. *Request for Expressions of Interest for the Provision and Delivery of a Recycling Program.* Regional Municipality of Hamilton-Wentworth, Feb., 1990.

Engineering Operations, Solid Waste Management Division. *Waste Management: A Citizens Guide.* Vol. 1 - Vol. 2, # 1, 1989-1990.

Environmental Assessment Board. "Notice of Main Hearing", *Flamborough News*. April 25, 1990.

Environment Canada, *Urbanization of Rural Land in Canada, 1981-1986: A State of the Environment Fact Sheet.* SOE Fact Sheet No. 89-1, 1989.

Environment Canada, *Land Use Change in Canada: Hamilton Urban Centred Region 1976-1980.* Lands Directorate Canada Land Use Monitoring Program, 1986.

Environment Canada and Ministry of the Environment. *Assessment of Aquatic and Terrestial Acid Precipitation Sensitivities for Ontario.* Inland Waters/Lands Directorate and Air Resources Branch, 1986.

Environment Canada, Inland Waters and Lands Directorate. *Wetland Distribution and Conversion in Southern Ontario, Working Paper No. 48*. Ottawa, 1987.

Environmentally Sensitive Areas Waiver Requests and Environmental Impact Statements, Region of Hamilton-Wentworth.

Estrin, D. and Swaigen, J. (1978) *Environment on Trial*, Canadian Environmental Research Foundation, Toronto.

Fairbairn, G.L. *Will the Bounty End?* Saskatoon: Western Producer Prairie Books, 1984.

Flamborough News "Maintaining the Family Farm Not Impossible Says Official" Jan. 24 1990.

Gordon, David. *Green Cities: Ecologically Sound Approaches to Urban Space.* Montreal: Black Rose Books, 1990.

Great Lakes Water Quality Board. *Report on Great Lakes Water Quality 1987.* International Joint Commission, 1987.

LAND

Great Lakes Water Quality Board/Great Lakes Science Advisory Board. 1985 Annual Report: Committee on the Assessment of Human Health Effects of Great Lakes Water Quality. International Joint Commission, 1985.

Guelph Mercury, "Farmers Must Practice Sustainable Agriculture Now" Feb. 6 1990.

Guelph Mercury, "Farm Traditions Caused Environmental Nightmares" Jan., 15 1990.

Guelph Mercury, "Soil Conservation Vital to Farms" Jan., 15 1990.
Hamilton Region Conservation Authourity. Memo on Wetlands Protection Program. Oct.18, 1989

Harvey, E. Correspondence. Ministry of Natural Resources, Resource Liason Officer, Cambridge District, 1989.

Hatch, D. "The Regulation of the Environment in Canada: Jurisprudential and Legislative Developments" in Environmental Law and Practise, proceedings of Canadian Bar Association - Ontario, Continuing Legal education, Young Lawyers' Division Ontario Conference. February 18, 1989.

Hough, Michael. "Naturalizing Parks and Non-Park Open Spaces", in Gordon, David, ed. Green Cities: Ecologically Sound Approaches to Urban Spaces. Montreal: Black Rose Books, 1990.

Inforesults Ltd. Farming in the Niagara Region: Structure, Trends and Land Use Policies: Policy Plan Review. Region of Niagara: 1989.

Jagger Hims Ltd. 1988 Annual Operating Monitoring Report Glanbrook Landfill Site. Hamilton: Regional Municipality of Hamilton-Wentworth, July 1989.

Lamont, Bill. Correspondence. Hamilton Naturalist Club, Field Biologist. May 1990.

Latter, Gillian. "HRCA Acquisition Ensures Preservation of Wetland", Flamborough News. March 28, 1990. p.3

Legal Services Department. Memorandum Concerning Steetley Industries Application to Amend Certificate of Approval. Regional Municipality of Hamilton-Wentworth, Feb. 28, 1990.

Lyle, John Tillman. Design for Human Ecosystems: Landscape, Land Use, and Natural Resources. Van Nostrand Reinhold Company: New York, 1985.

LAND

MacDonald, G.M. "Forests of the Hamilton Region: Past Present and Future", Steel City: Hamilton and Region. Toronto: Dear/Drake/Reeds, 1987.

Makuch, S. (1983) Canadian Municipal and Planning Law, Carswell, Toronto, Ontario.

Marlin, Beth. "Board Cans GASP Bid for Cash to Fight Dump", Hamilton Spectator, Wed. May 16, 1990.

Ministry of Agriculture and Food, Agricultural Statistics for Ontario: 1987. Statistical Services Unit: Publication 20, 1988.

Ministry of Agriculture and Food, Agriculture at a Glance in Hamilton-Wentworth. 1989.

Ministry of the Environment, DRAFT: Air Quality in Hamilton-Wentworth 1988. 1989.

Ministry of the Environment. Acidic Precipitation in Ontario Study: Annual Program Report 1988/1989. January, 1990.

Ministry of the Environment. Guidelines for the Decommissioning and Cleanup of Sites in Ontario. 1989.

Ministry of the Environment, Waste Management Branch. Provincial Plan Targets of 25% Recycling by 1992. 50% by 2000. News Release, Mar., 1989.

Ministry of Municipal Affairs, Background Bulletin. Issue # 90/3, Jan. 1990.

Ministry of Natural Resources and Ministry of Municipal Affairs, Policy Statement Wetlands; A proposed policy statement of the Government of Ontario issued for public review. Ontario, 1989.

Ministry of Natural Resources. Guidelines for Wetlands Management in Ontario.

Ministry of Natural Resources. Wetlands Evaluation Summary Report. Toronto: Central Region, December, 1989.

Ministry of Natural Resources, A Review of the Conservation Authourities Program. Ontario, 1987.

Ministry of Natural Resources, Aggregate Resources Inventory of the Regional Municipality of Hamilton-Wentworth. Ontario Geological Survey: Paper 50, 1984.

LAND

Ministry of Natural Resources, Mineral Aggregate Resource Planning Policy Statement. Ontario, 1982.

Ministry of Natural Resources, Mineral Aggregate Transportation Study. Ontario, 1980.

Ministry of Northern Development and Mines: Information and Statistics Section, 1988 Ontario Mineral Score. 1989.

Moxley, Jacqueline. Survey of Pesticide Use in Ontario, 1988. Toronto: Economics and Policy Co-ordination Branch, Ontario Ministry of Agriculture and Food, July, 1989.

Ohlendorf-Moffat, Pat. "September in Summer: Something's Killing Toronto's Trees". Toronto Magazine: Toronto Globe and Mail. Toronto: June 1990.

Pesticide Action Group. Report of the Pesticide Action Group. Guelph: March, 1990.

Phillips, P. (1987) "Groundwater Protection Activity" in Urban Land, August 1987, pp34-35.

Planning and Development Department, Vacant Residential Land Inventory. Region of Hamilton-Wentworth 1990.

Planning and Development Department, Hamilton-Wentworth Population Projections 1988-2006. Region of Hamilton Wentworth: 1989.

Planning and Development Department, Greater Hamilton Population Trends. Region of Hamilton-Wentworth: Demographics Report 87-1, 1987.

Planning and Development Department, Greater Hamilton Population Trends. Region of Hamilton-Wentworth: Demographics Report 89-1, 1989.

Planning and Development Department, Land Use Characteristics 1982. Region of Hamilton-Wentworth: 1983.

Planning and Development Department, Land Use Characteristics 1987. Region of Hamilton-Wentworth: 1989.

Planning and Development Department, Local Planning Branch. Information Hamilton. Regional Municipality of Hamilton-Wentworth, 1989.

LAND

Planning and Development Department, Information 81. Hamilton-Wentworth: 1981.

Pollution Probe, The Green Consumer Guide. Mclelland & Stewart: Toronto, 1989.

Rathje, William. "Rubbish!", The Atlantic Monthly. December, 1989.

"Recycling a 'Financial Monster' Durham Works Committee Says", Toronto Star, Friday, May 4, 1990 p.A10

Regional Municipality of Hamilton-Wentworth. Official Plan. 1980.

"Residents Respond to Illegal Dumping Problem". Flamborough News. Wed. May 30, 1990.

Robertson, H. "The McClure Crescent Irregulars" in Harrowsmith, pp32-39.

Royal Botanical Gardens. "Restoration of Cootes Paradise Marsh", The Gardens Bulletin. Spring 1989.

Rural Learning Association. Farmland Under Siege. Guelph, Ont.: 1989.

Rural Learning Association. Waste Management. Guelph, Ont: 1989.

Salvesen, D. (1988) "Liability for Hazardous Waste Cleanups: Caveat Emptor" in Urban Land", April 1988, pp36-37.

Saxe, D. "Toxic Real Estate: An Overview" in Hazardous Materials Management Magazine. Sept/Oct 1989, p9.

Saxe, D. Contaminated Land. Unpublished research paper prepared for the Law Reform Commission of Canada's Protection of Life Series

Schwab, J. "Hazardous Waste: What Goes Around Comes Around" Planning, Feb. 1988 ,p.18-23.

Shier, D.S.K. "Toxic Real Estate in Your Backyard" in Municipal World, May 1989(Part 1) and June 1989 (Part 2).

Sisson, K, Shier, D. and Willms, J. Toxic Real Estate Manual. Published by Willms and Shier, Toronto, Ontario, 1989.

LAND

Sproel, C. "Toxic Real Estate and Environmental Audits: Environmental Considerations in Real Estate And Commercial Transactions" in Environmental Law and Practise, Proceedings of Canadian Bar Association - Ontario, Continuing Legal Education, Young Lawyers' Division Ontario Conference. 1989.

"Spray Program Should Prevent Defoliation of Dundas Valley", Ancaster News Journal, Wednesday, April 18, 1990. p.14

"Steetley Landfill Closing Raises Dilemma, Suspicion", Dundas Journal. Sept. 20, 1989.

Sukopp et al, Ecological Principles for Physical Planning.

Svelha, Janette. Assessment of Existing Biological Data on Environmentally Sensitive Areas. Hamilton Naturalist Club, 1990.

Thompson, Allan. "2 Firms Join Forces to Recycle Dry-wall", Toronto Star. May 11, 1990, C3)

"Town Plans to Lower the Boom on Illegal Dumping", Flamborough News. May 16, 1990.

United Nations, World Conservation Strategy 1980.

Water Management Advisory Board. Staff Report: Steetley Quarry Products Inc. South Quarry Landfill Draft Environmnetal Assessment. Hamilton Conservation Authourity, Feb., 1990.

WCI Waste Conversion Inc. Municipal Recycling Plan for Hamilton-Wentworth. Regional Municipality of Hamilton-Wentworth, 1989.

WCI Waste Conversion Inc. Solid Waste Routing Strategy. Regional Municipality of Hamilton-Wentworth, 1988.

Woo, Ming-Ko. "Hydrology of Beverly Swamp" in, Steel City: Hamilton and Region. Toronto: Dear/Drake/Reeds, 1987.

Wren, D.M. (1983) "Coping with Environmental Regulation in Canada" in Urban Land, March 1983, pp36-37.

2.4 HUMAN HEALTH RISK

This section has been written by Dr. Brian Gibson, the Associate Medical Officer of Health for the Region.

Today we realize more and more the profound connection between the environment and our health. We fear that the chemicals we use and then discard into the air, the soil, our rivers, lakes and oceans may be coming back to poison us in the air we breathe, the water we drink and the food we eat. But there is an even greater danger that the burden of toxic chemicals that we are putting into the environment is destroying the relationships that unite all living creatures on this planet into one ecosystem. The ultimate toll of human suffering, starvation and death may be much greater because of the damage we are causing to the ecosystem than the direct effect of toxic chemicals on our health. This section, however, is addressed to our fears about toxic pollution and the direct impact it has on our health. How bad is it really?

There are three different questions that must be answered to address the problem of environmental health risks:

- how big is the risk?
- What is an acceptable risk? and acceptable to whom?
- What can and should we do about the problem?

Many factors influence our risks of illness from exposure to a toxic chemical. Two critical factors are the magnitude and duration of the exposure. Although we may fear that we are being exposed to a hazardous substance, in many circumstances our scientific knowledge of exposures is skimpy. Because our knowledge of exposures is very often poor it can be very difficult to accurately determine what the health risk is from a particular exposure. Often we guess based on experiments on animals. These estimates can be better measures of the true risk than studies that try to count people who are ill because of a particular exposure.

There are two broad categories of environmental health problems:

1. Those that produce an effect on everyone who is exposed such as breathing difficulties, nausea, liver damage, etc. These problems are dose dependent, i.e. low level exposure usually produces only a low-level effect. The effects show up immediately after exposure, not years later. As an exception, however, low levels of chemical exposure can produce an allergic sensitization to a chemical that does produce a severe reaction that is delayed and the reaction occurs only with reexposure to the chemical.

2. Those that are a matter of chance, (a child has a birth defect, you get cancer) where the consequence is dire but most escape it. The odds get worse as the exposure increases. These health problems are related to genetic damage, either the toxic bullet hits or misses. Some like birth defects will manifest themselves shortly after exposures, but others like some cancers, may not show up for decades.

Occupational exposure to relatively high levels of chemicals and environmental accidents have given us good estimates of the risks in the first category for many chemicals. We know, for example, what levels of sulpher dioxide, nitrogen oxides and ozone will cause health problems in an air pollution episode. Although research has established that low levels of lead exposure can cause neurological impairment in young children, low level exposure will only cause minor impairment.

Although we don't know the specific risks of genetic damage related to specific chemicals or radiation and biological hazards, we do have a good idea of what the sum of all risks is. If all cancers and birth defects were caused by toxic exposures, the total risk from past exposure isn't greater than the current burden of illness of this kind. However, there are many cancers related to current exposures that will not occur for some time. Although we have been bringing new chemicals into use and the level of pollution in the environment for many chemicals is increasing, workplace exposures to the known bad actor chemicals has been reduced significantly in the last several decades. If the environmental pollution is controlled and the burden of toxic chemicals already in the environment reduced by clean-ups, these health outcomes should eventually improve.

Acceptable Risk

The acceptability of a risk is a very different matter than just the size of the risk. We willingly accept risks in our recreational activities and personal choices that are much greater than many of the risks from environmental pollution. As a society we set safety standards for roads, buildings and many areas of our life that most of us consent to. The automobile as a physical hazard presents a much greater risk to our health than the immediate toxic effects of the pollutants cars emit.

We do not, however, accept risks that are imposed on us without our consent, or for another's benefit or profit, e.g. the employer who exposes workers to occupational chemical hazards or the manufacturer who puts unsafe products on the market.

We know that environmental risks are distributed on an unequal basis according to social class and status. The inequities in the social distribution of risks, the involuntary nature of many environmental health risks, the seperation of those who benefit from pollution from those who experience the risk, lie at the root of most disputes about environmental health hazards.

The real issue is rarely the magnitude of the environmental risk, because when the risk is large and certain, all sides agree to lessen it. When the risk is uncertain, valid issues of social justice with respect to the acceptability of the risk become crucial.

What to do about a specific risk is a different question again. The magnitude of the risk is one consideration, as well as cost and acceptability, or purely objective considerations about what interventions are available and how effective they are. Some risks can be much more expensive to reduce than others. It can also become more and more expensive to reduce risk to lower and lower levels. Money needs to be spent where it will do the most good in reducing the sum of environmental risks but also where it will address in a significant way the societal inequities inherent in many environmental risks.

Conclusion

We do not live in a world in which we are all doomed to die because the air, our water and food are poisoned. We have a good idea of many situations in which there are health risks. We need to understand and study the risks associated with genetic damage related to chemicals not so much in the area of cancer (because the effect is so delayed) but in the area of birth outcomes.

The social injustices related to the inequities in environmental health risk distribution have long been a political issue. We are now realizing that the injustice we do to all the other living organisms on the planet by our pollution is perhaps the greatest threat of all to our health.

3. CONCLUSION

The complexity of ecological systems and the diversity of the Region makes it difficult to give a general statement about the environment that does justice to the various issues involved. Nevertheless, the information collected from numerous reports suggests that important strides have been made in recognizing environmental problems created in the past and that in many areas efforts to minimize environmental damage are beginning to show results.

Global environmental concerns are relatively well-documented. Many of these concerns are applicable at the Regional scale. These include, reductions in the number and variety of species, loss of habitat (particularly forests), loss of productive topsoil, water contamination, air pollution especially from internal combustion engines and long-term changes in the chemical make-up of the atmosphere.

PROGRESS HAS BEEN MADE

Many agencies and citizens in the Region have recognized that global problems are the results of cumulative local actions and therefore that solutions must also start at the local level. During the last ten years or so industrial and municipal air emissions and discharges into watercourses have been significantly reduced. Major identifiable point sources of pollutants, smoke-stacks and waste-water pipes, are releasing fewer contaminants than 10 or 15 years ago. More energetic regulation by the Ministry of Environment has resulted in the application of improved technology and changes in processes and treatment of waste by-products by industry and municipal waste treatment facilities. Levels for many pollutants have declined.

However, the job of reducing the flow of contaminants into the environment is not complete. Furthermore, the contaminants now in the environment may persist for long periods of time. To fulfil the promise of reductions in the levels of contaminants, the enforcement of existing regulatory authority is expected to require the continued commitment of money and political will.

CONCLUSIONS

CONCLUSION

FACING UP TO THE MORE DIFFICULT ISSUES

It is evident that many of the environmental problems we continue to face involve the cumulative impact of both the uses we make of our land resource and the consumption inherent in our collective lifestyle.

Cumulative Impacts of Land Development

There are many agencies mandated to protect or improve the preservation of key resources such as farmland and the remaining forests and natural areas of the Region. The changing spatial organization and the existing infrastructure of our communities reflect the desire of many people to live in a suburban or rural atmosphere. New development in formerly rural areas or urban fringe areas tests our ability to protect small natural stream areas, to save farmland from development, to reduce the use of the automobile or to lessen the need for new roads.

Our willingness to control the negative impact of human activity has not seen the same level of improvement evident in the control of contaminants. Farmland, forests and natural areas continue to face the threat of piecemeal urban encroachment. Wild animal and plant species struggle to exist not only as a result of pollutants in the water and air affecting their health and reproduction but also because their natural habitats are being destroyed or degraded.

In some cases the lack of knowledge of the biological systems we are dealing with makes it difficult to draw the line beyond which development is unacceptable. In other cases, the rights or wishes of property owners conflict with public goals and trade-offs are made. The ways in which the various levels of government interact and the ways in which individual governments divide responsibility between various departments sometimes create difficulties in dealing with environmental issues. Occasionally the enabling statutory authority is missing. Certain issues cut across so many jurisdictional lines that the organization of a co-ordinated approach is frustrated.

Information sharing such as the recently proposed Natural Areas Inventory Project should have a positive outcome on the collective capacity to deal with issues related to natural areas. However, better information is only the first step. We also need a commitment to developing a comprehensive strategy for conserving resources and rehabilitating important natural areas. Fortunately many of the projects described in this Report indicate that this commitment exists, even if in a fragmented and unco-ordinated way.

CONCLUSION

Some of the most recent government initiatives reflect the principle that reducing the flow of toxic material can be accomplished through reduction at source rather than relying on expensive and perhaps ultimately unsatisfactory changes to the treatment process at the end of the pipe. This means education and assistance for homeowners and industrial sewer users. Preventing pollution in the first place will require changes in the ways we make and use many consumer and industrial products.

Consumption and Lifestyle

The individual's role in the creation and resolution of broader scale environmental problems is accepted in the successful application of the Blue Box recycling programs. Likewise, private automobiles, household cleaners and many other basics of our everyday existence are acknowledged to be contributing factors to unhealthy levels of contamination.

Important components of the pollution problems we must deal with are those caused by vehicle emissions, household cleaners going down the drain, and non-point sources of contaminated run-off from streets and fields. These are small and widely distributed sources of pollution that all add up but are difficult to assess and regulate.

If present population growth patterns continue our present infrastructure and treatment methods may be hard pressed to save receiving water bodies from damaging amounts of contaminants. For instance, municipal sewage treatment plants were not designed to remove the variety of chemicals households and industries release into the sewers.

Education and the promotion of alternatives are identified by many agencies as the focus for future activity. Polls show that three out of four Canadians accept the idea that the environment can only be protected if average citizens are willing to make personal sacrifices in the comfort and quality of their daily lives. Policies, programs and initiatives increasingly reflect this idea that a partnership between individuals, business and government is necessary to overcome the problems we face in trying to maintain a viable and diverse natural system for future generations.